

TEXTILES AND TEXTILE PRODUCTION IN EUROPE

From Prehistory to AD 400



edited by

Margarita Gleba and Ulla Mannering

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CONTENTS

Foreword	v
Preface	vi
List of Maps	viii

Introduction: Textile Preservation, Analysis and Technology.....	1
<i>Margarita Gleba and Ulla Mannering</i>	

Austria

1. Austria: Bronze and Iron Ages	27
<i>Karina Grömer</i>	
2. Austria: Roman Period	65
<i>Kordula Gostenčnik</i>	

Denmark

3. Denmark	91
<i>Ulla Mannering, Margarita Gleba and Marianne Bloch Hansen</i>	

Germany

4. Germany: Bronze and Pre-Roman Iron Ages.....	122
<i>Susan Möller-Wiering</i>	
5. Case Study: The Textiles from the Princely Burial at Eberdingen-Hochdorf, Germany.....	139
<i>Johanna Banck-Burgess</i>	
6. Germany: Roman Iron Age.....	153
<i>Susan Möller-Wiering and Julian Subbert</i>	

Greece

7. Greece	185
<i>†Youlie Spantidaki and Christophe Moulherat</i>	

Italy

8. Italy: Bronze Age.....	203
<i>Marta Bazzanella</i>	
9. Italy: Iron Age.....	215
<i>Margarita Gleba</i>	
10. Case Study: The Textiles from Verucchio, Italy	242
<i>Annemarie Stauffer</i>	
11. Case Study: The Tablet-Woven Borders of Verucchio.....	254
<i>Lise Ræder Knudsen</i>	

Latvia

12. Latvia266
Irita Zeiere

Norway

13. Norway275
Sunniva Halvorsen

Poland

14. Poland293
Jerzy Maik

Slovak and Czech Republics

15. Slovak and Czech Republics306
Tereza Belanová-Štolcová

Spain

16. Spain334
Carmen Alfaro Giner

Sweden

17. Sweden349
Mari-Louise Franzén, Amica Sundström, Eva Lundwall and Eva Andersson Strand

Switzerland

18. Switzerland: Neolithic Period367
Fabienne Médard
 19. Switzerland: Bronze and Iron Ages378
Antoinette Rast-Eicher

Ukraine

20. Ukraine399
Margarita Gleba and Tatjana Krupa

United Kingdom and Ireland

21. Scotland and Ireland428
Elizabeth Wincott Heckett
 22. England: Bronze and Iron Ages444
Dee DeRoche
 23. England: Roman Period451
John Peter Wild

- Index457

Foreword

Lotte Hedeager and Kristian Kristiansen

Over the last 10–15 years, textile studies have moved from being a specialised niche at the academic periphery towards the centre stage of archaeological and historical research. This book, originating from the Danish National Research Foundation's Centre for Textile Research (CTR) at the SAXO Institute, University of Copenhagen is a testimony to the sustained and systematic efforts behind such a development. Furthermore, it is a major contribution to the expanding field of textile research, just as it adds yet another publication to the Oxbow Ancient Textiles Series, which has opened up the field to the non-specialist. Beginning with the major synthesis 'Ancient Textiles: Production, Craft and Society', which took the reader around all important aspects of textile production and consumption in the ancient world, as handed down through texts, iconography and archaeological finds, this most recent book addresses the archaeological traces of textile production and consumption during the Bronze and Iron Ages in Europe. The overview is systematically organised country by country, and each chapter is structured according to the same plan, beginning with chronology and cultural history and then moving on to a discussion of the archaeological evidence of textiles and their production.

It will be an invaluable guide for the increasing number of archaeologists who understand the central role played by textiles,

their production, distribution and consumption during later prehistory. Compelling new evidence from strontium isotope analyses of textiles is now for the first time able to trace the origin of textiles, and the first results from the well-known Huldremose woman's dress, a bog sacrifice from Denmark, demonstrate that some of the materials for clothing and the woman probably originated outside Denmark. New studies of textile technologies are also increasing our understanding of the complexity and sophistication of textile production in Europe from the Bronze Age onwards, when wool production took over as the dominant material, and subsequently changed the animal economy towards this new domain. We know from the famous texts in ancient Anatolia of how the Old Assyrian caravan trade during the 19th to 18th centuries BC was organised around the highly profitable trade in fine textiles, and it is now becoming increasingly evident that a major shift occurred also in Europe, where new wool clothing encultured the Bronze Age body, and created an entirely new economic sector that persisted and expanded into the Iron Age.

The articles in this book not only provide an overview of the evidence, but also summarise recent research. The editors and the authors are to be congratulated for presenting such a major, systematic endeavour which will serve archaeological research in years to come.

Preface

This book had its genesis in 2007, when the Danish National Research Foundation's Centre for Textile Research organised the international conference "Textiles in Context" at the University of Copenhagen, Denmark. A group of specialists from across Europe were invited to bring their knowledge of textiles and textile production from their respective regions to Copenhagen in order to help place the unique Danish prehistoric textile and costume collections from the Bronze and Early Iron Ages into a wider context. Since then, more colleagues have joined this project resulting in the present 23 articles.

The book is organised geographically by country since these are the modern boundaries within which most archaeological research is conducted today. Each section is accompanied by a map of the sites mentioned and a chronological table for the region. Depending on the specialist knowledge, the material from the same region is in some cases split up into several articles (*e.g.* Italy, Germany, Austria, UK), while in others, two countries are covered by the same article (*e.g.* Czech and Slovak Republics, Ireland and Scotland). In the case of particularly important groups of finds, special case study articles are included (*e.g.* Verucchio and Eberdingen-Hochdorf).

All chapters generally follow the same structure: introduction, chronological and cultural background, and an overview of the material in question organised chronologically and thematically. The sources of information used by the authors are primarily textiles and

textile tools recovered from archaeological contexts. In addition, other evidence for the study of ancient textile production, ranging from iconography to written sources to palaeobotanical and archaeozoological remains are included. **The chronological period covered** in the articles spans from the earliest prehistoric finds to *c.* AD 400. In some cases however, the presented material ventures into slightly later periods (*e.g.* Norway). In principle, the overviews stop at the time of the collapse of the Roman Empire since its aftermath brought many new transformations to the social, economic and ethnic organisation of Europe. Textile technology, too, underwent drastic changes in the following centuries eventually culminating in the medieval textile industry.

For most regions, the articles in this book provide the first synthetic overviews on the topic, and, in some cases, this information has not been published earlier. For example, the investigation of Greek textiles has only begun in the recent years and it **has not yet been** possible to compare them to surviving tools as well as written and iconographic evidence in a systematic manner. Likewise, **most of** the data on Ukrainian material has been unknown or inaccessible to western scholarship due to the linguistic barrier.

As editors, we have aimed at giving a balanced picture of the presented data, although the countries differ in size and **not** all periods are equally represented for each country. Furthermore, **the quantity, kind and** preservation of the recovered archaeological material vary considerably throughout the European regions. Europe has almost all

types of textile preservation conditions, but they are not equally distributed throughout the continent. For example, the salt mines of Hallstatt have created a unique environment for the preservation of textiles that were discarded during their use in the Bronze and Iron Ages. Textile production is hence well represented in Austria for these periods, although most of the preserved textiles are very fragmentary. The deposition of clothed bodies in peat bogs in Early Iron Age Denmark has ensured the survival of a large corpus of textiles and complete garments in this context, while textiles from graves are rare. The cremation burial practice used during the Late Bronze Age in Scandinavia has resulted in the virtual absence of textiles from this period compared to the well-preserved costumes from the Early Bronze Age oak coffin graves.

Another important factor is how and when this material was investigated. Scandinavian countries and Germany, for example, have long-standing traditions of textile scholarship, while in Mediterranean Europe, particularly in Italy and Greece, the topic has only been broached within the last decade.

The authors have collected and systematised essential information on textiles and textile production from each country, resulting in an up-to-date and detailed sourcebook and an easily accessible overview of the development of European textile technology and economy from prehistory to AD 400. It is our hope that this book will bring textiles to the attention of a wider range of scholars. As not all European regions are covered in this book and, in the case of some regions, the chronological coverage is incomplete, we also hope that this book will inspire the writing of similar overviews of textiles and textile production in other

European countries. A recent overview for the Netherlands was published by Sandra Comis (in L. Bender Jørgensen, J. Banck-Burgess and A. Rast-Eicher (eds), *Textilien aus Archäologie und Geschichte*, 193–204, 2005), while a summary of Roman period textiles found on the territory of France was published by Sophie Desrosiers and Alexandra Lorquin (in L. Bender Jørgensen and C. Rinaldo (eds), *Textiles in European Archaeology. Report of the 6th NESAT symposium, 7–11th May 1996 in Borås*, 53–72, 1998).

This book would not have been possible without the help of numerous people. Marie-Louise Nosch as director of the Danish National Research Foundation's Centre for Textile Research at the University of Copenhagen has provided the organisational framework for the editing of the book. Cherine Munkholt has assisted the editors during the proofreading and copyediting process. Vibe Maria Martens, Marianne Bloch Hansen, Peder Flemestad, Henriette Koefoed, Sidsel Frisch, Niels Møldrup Petersen, Sandra Holm, Egzona Haxha and Ingeborg Philipsen have helped with proof-reading, images, maps, communications and numerous other tasks. Joanne Cutler and Sergei Polin kindly provided information on the archeological background of Greece and Ukraine. Susanna Harris helped with the introduction. Yevgeny Kokorin created maps. Sylvia Mitschke provided images for the chapters on Germany. Juliet Blackmore created the layout. We thank them all and the authors of the following chapters for their enthusiasm and desire to participate in this pioneering endeavour. The project and the publication of the volume have been financed by the Danish National Research Foundation with support from the Culture Programme of the European Union DressID programme.

Margarita Gleba and Ulla Mannering

February 2011

List of Maps

Map 1.1. Austria	Map 13.1. Norway
Map 3.1. Denmark	Map 14.1. Poland
Map 4.1. Germany	Map 15.1. Slovakia and Czech Republic
Map 6.1. Germany	Map 16.1. Spain
Map 7.1. Greece	Map 17.1. Sweden
Map 7.2. Greece, closeup of Attica	Map 18.1. Switzerland
Map 8.1. Italy	Map 20.1. Ukraine
Map 9.1. Italy	Map 21.1. Scotland and Ireland
Map 12.1. Latvia	Map 22.1. England

Introduction: Textile Preservation, Analysis and Technology

Margarita Gleba and Ulla Mannering

Why Textiles?

Using DNA to trace the evolutionary split between head and body lice, researchers recently concluded that body lice evolved from head lice approximately 190,000 years ago, pushing the time when human beings first began wearing clothing at least 100,000 years back (Bower 2010). While in those remote times clothing may have had a primarily utilitarian function and possibly permitted the hominids to occupy climatic zones that were previously inaccessible to them, soon garments became more than a mere secondary skin. Many of the famous ‘Venus’ figurines of the Upper Palaeolithic (*c.* 27,000–20,000 years before present) wear sophisticated elements of clothing (Barber 1991, 40, 255–257; Soffer *et al.* 2000b). The earliest textiles found thus far in the Czech Republic also date to the Upper Palaeolithic and include “single ply, multiple-ply, and braided cordage, knotted netting, plaited wicker-style basketry, and a wide variety of non-heddle-loom-woven textiles, including simple and diagonal twined pieces and plain woven and twilled objects” (Adovasio *et al.* 1996; Soffer *et al.* 2000a; 2000b, 513). None of this clothing is of any use for either warmth or what we would call modesty; rather it appears to have been intended to communicate messages.

Ever since, textiles express who we are – our gender, age, family affiliation, social, political, economic and legal status, occupation, religion and ethnicity (Schneider and Weiner 1989).

Besides expressing our identity, textiles protect us from harsh environmental conditions, whether as clothing or shelter. We use them at birth for swaddling, in illness as bandages and at death as shrouds. We use them to carry and contain people and things. We use them for subsistence to catch fish and animals. We use them for transport as sails. Knowledge of textile history is hence the key to our understanding of a multitude of human issues. In fact, textiles represent one of the earliest human craft technologies, and they have always been a fundamental part of subsistence, economy and exchange. Textiles have an enormous potential in archaeological research being able to inform us of social, chronological and cultural aspects of ancient societies.

It is the aim of this book to make textile research a more user-friendly field for researchers working on the archaeology and history of Europe by providing overviews of the extant material and sources of evidence for specific regions. The following summary on textile preservation, analytical techniques and production sequence should provide a background for the terminology and issues discussed in the various chapters.

For the purposes of this book, we take a broad definition of textile as “all the products of textile techniques that consist of basic elements (thread or groups of threads) which have been interworked by mechanical means to obtain the necessary coherence” (Seiler

Baldinger 1994, 5). In addition, skin/leather items and basketry are occasionally considered together with textile material.

Textile Preservation

Like most organic materials, textiles are subject to rapid decomposition in archaeological contexts and their preservation requires special conditions to prohibit their destruction by microorganisms (Wild 1988, 7–13; Peacock 2005; Gillis and Nosch 2007).

Thus, dry climate has preserved textiles by desiccation in Egypt (Barber 1991, 145ff; Vogelsang Eastwood 2000; Kemp and Vogelsang-Eastwood 2001). Wet environments can also be favourable for the preservation of organic materials as the anaerobic conditions inhibit the growth of microorganisms that cause decay. Waterlogged burials throughout Europe have produced many of the surviving textiles. The pH value of water or soil significantly influences conservation: plant fibres are rarely preserved in acidic environments, while animal fibres are for the most part destroyed by basic conditions (Rast-Eicher 2003, 47). Thus, in Denmark, wool textiles have been preserved in acidic peat bogs (Hald 1980), while the more alkaline conditions of Swiss and Italian lakes have predominantly yielded fabrics made of plant fibres (Bazzanella *et al.* 2003).

Constant temperatures below 0°C preserve all organic material almost unaltered. The garments of the Iceman Ötzi, dated by radiocarbon to 3350–3100 BC, discovered in an Alpine glacier of Italy, survived in permafrost conditions, providing a first glimpse of Chalcolithic costume practices of Europe (Spindler *et al.* 1995). In Eurasia, the frozen contents of Scythian tombs preserved fabrics almost perfectly (Rudenko 1970; Polosmak and Barkova 2005), while on Greenland, the permafrost conditions conserved the medieval garments of the early European settlers buried there (Østergaard 2004).

Salt has preserved textiles in Austrian mines (Bichler *et al.* 2005) and the Tarim basin in north-west China (Trevor 1932; Barber 1999; Zhao and Yu 2002). Dry conditions and the presence of salt are particularly favourable for dye preservation while wet environments usually degrade colouring agents.

Textiles can also be preserved through exposure to fire, which leads to the creation

of carbonised remains. Plant fibres, in fact, are often more stable in a carbonised state than in their original shape, especially in wet environments (Rast-Eicher 2003, 47). Animal fibres, on the other hand, usually perish in fire (Rottoli 2005, 66).

In the presence of metal objects, textiles may become mineralised in metal corrosion products which form casts around fibres retaining their external morphology and size almost unaltered (Jakes and Sibley 1984; Janaway 1987; Chen *et al.* 1998). The conditions conducive to mineralisation depend on pH value, oxidation potential and moisture, as well as the composition of the fibre, and on the elemental composition of the soil and metal (Janaway 1987, 136–142; Gillard *et al.* 1994). Iron and bronze in particular favour the formation of easily legible traces. Most of these corrosion-preserved textiles originate from inhumation graves. Even when minute, such traces can provide a considerable amount of information about ancient textiles (*e.g.* Bender-Jørgensen 1986; 1992; Rast-Eicher 2008).

Mineralisation can also occur in the presence of calcium in the matrix surrounding the decaying textile, whereby a cast of gypsum or calcium carbonate forms (Reifarth and Drewello 2011). In contrast to metal mineralisation, in this case dyes can survive (James *et al.* 2009).

Textiles can also be preserved in the form of imprints. These are negatives of the original fabrics, created, for example, when the fabric comes in contact with clay objects or surfaces before they are fired. Some of the earliest evidence for woven fabric, in fact, survives in the shape of such imprints, as in the case of the Upper Paleolithic Czech site of Pavlov I (Adovasio *et al.* 1996; Soffer *et al.* 2000b).

Finally, soil discolouration or soil surface structures can indicate the presence of textiles. At Castel di Decima in Italy, for example, dark spots of an organic nature were observed at the shoulders of some skeletons, which, excavators believe, represent the traces of bunched cloth where the fibulae held it (Zevi and Bedini 1973, 32). Meanwhile, in the Athenian Agora, soil features resembling textiles have been noted (Unruh 2007).

Whatever the condition of preservation, textile recovery greatly depends on excavation methodology and conservation procedures (Gillis and Nosch 2007). The micro-excavation approach, in which entire blocks of earth

containing archaeological material are lifted and brought to the laboratory, where they are then carefully excavated by conservators using special equipment and under controlled conditions, has been especially successful in textile recovery and preservation. Their prompt consolidation, documentation and conservation, given the usually advanced state of degradation, are essential.

Textile Analysis

As the end product of an intricate and lengthy manufacturing process, a textile contains information about the various stages of the process and the tools used in it. ‘Decoding’ textiles is thus imperative for our understanding of this process. While the methods used in textile analysis vary depending on the state of a textile’s preservation, often requiring a combination of several analytical procedures, the basic examination of a textile can be performed by the naked eye in combination with microscopy (Fig. 0.1; Walton and Eastwood 1983). The optical microscope has long been the preferred method but it can be supplemented by more advanced methods. Scanning electron microscopy (SEM) is used in the identification of fibres by comparison with reference standards (Fischer 2010). Animal fibres, if well preserved, can be recognised by the scales or *cuticulae* on their surface; the shape, position and sequence of these scales present on the fibre surface can then be used to identify the animal species (Appleyard 1960). The identification of plant fibres is often more complicated since the distinction between flax, nettle, hemp and some other plant species is difficult to make even in the laboratory, particularly when they are degraded (Cattling and Grayson 2004). With the use of a microscope, it is also possible to observe the wear and damage of individual fibres, which can provide information about the use and function of the textile as well as the duration of its utilisation (Wild *et al.* 1998). Hidden structures, especially pertinent in the case of mineralised examples, can be investigated by X-ray and, recently, by computerised tomography of three-dimensional objects (Peek and Nowak Böck 2007).

The most important descriptive parameters of an archaeological textile to be recorded and the information they may provide during such



analysis are summarised in Table 0.1. Many of these features are important parameters in themselves, and together with contextual data they can be used as social, cultural, geographical and/or chronological indicators. However, they are most informative when considered in combination.

While basic analysis constitutes standard operating procedure in textile investigation, in recent decades textile archaeology (and archaeology in general) has been enriched by many approaches that come from other disciplines. Analytical methods from the natural sciences have been adapted and used to extract new types of information from archaeological material. Examples include, among others, isotopic tracing to determine geographical provenance (Frei *et al.* 2009a;

Fig. 0.1. Investigating archaeological textiles (Photo: M. Gleba).

Parameter	Data	Information
Context	settlement burial sacrifice	date, function
Dimensions	overall specific structural elements	preservation (complete or fragmentary) and use of the textile
Preservation	organic mineralised carbonised	data and type of analyses that can be performed, as well as conservation strategies
Colour	discolouration natural pigmentation presence of dyestuffs	available resources and technologies to obtain, apply and combine colour for aesthetic and/or functional purposes
Textile structure	weave type thread count borders and selvages	weaving technique and the choices made to produce a specific textile for a specific purpose
Yarn structure	spin/twist direction twist angle yarn diameter	spinning technique and the choices made to produce a specific yarn
Raw material	fibre morphology	local availability of resources or their exchange, selection and preparation of raw material, properties of this material as well as its possible use
Errors	irregularities faults	skill or number of weavers that worked on the piece; evidence for determining warp and weft and thus possibly for the type of loom used
Decoration	embroidery appliqués needle holes	function, meaning, value of the textile
Wear	holes creases folds	function, degree and duration of use
Repair	mends darns patches	degree and duration of use, re-use and the value of the textile
Construction	tailoring combination of materials	use of the textile in costume, the user (male, female, child) and, sometimes, the user's role in society
Finishing	napping pleating	function

Table 0.1. Parameters for textile analysis.

2009b), radiocarbon dating (Nockert and Possnert 2002; Mannering *et al.* 2010), x-ray spectroscopy for mineralised textiles (Nowak-Böck 2010), and DNA analysis for species identification (Brandt *et al.* 2011).

Dye and mordant identification usually requires sophisticated chemical analyses, the most advanced technique currently being high performance liquid chromatography (HPLC), which allows us to identify, quantify and purify the individual dye components (Hofmann-de Keijzer *et al.* 2005; Vanden Berghe *et al.* 2009). Nonetheless, positive identification of a particular dye present on a fibre is extremely difficult since the results of these analyses identify only the more stable chemical components of the dyes which may be present in many different plant species. Thus, it is often impossible to ascertain what specific plant or combination of plants was used in the dyeing process. The majority of dyes, however, were

most likely obtained from locally available plants, animals and minerals.

In addition to the investigations of the textiles themselves, tool studies have had a great impact on our understanding of textile production and the processes involved (Andersson 2003; Gleba 2008; Mårtensson *et al.* 2009). Another methodological impact on textile research comes from the study of craftsmanship and experimental archaeology, often the combination of the two (Grömer 2005; Andersson Strand 2010; Hurcombe 2010). The results from experiments and tool studies constitute an important basis for the interpretation of the function of the various tools and for the evaluation of the kinds of textiles that could be produced at a given site.

Textile Production

In order to produce a textile, a number of

operations have to be performed to transform the raw material into a finished product. The sequence of textile production begins with the choice of raw material and continues with its transformation until a final product is obtained. Raw fibres have to be prepared, spun, woven and finished. Each of these processes requires a specific set of tools and skills.

Archaeological indicators of any productive activity include installations, tools, residue or by-products, unfinished or defective products, raw materials as well as the products themselves. The vast majority of surviving evidence for textile production consists of tools. Occasionally, installations, such as dyeing vats can be recognised. The heaps of muricid shells remaining from purple-dye production can be regarded as residues or by-products of the latter process. Raw materials and unfinished or defective products are almost non-existent.

The following section provides an overview of archaeological evidence (textiles and textile tools) for the numerous stages of textile production, forming a basis for the terminology used throughout this volume.

Preparing the Fibres

Fibre is a basic unit of raw material having suitable length, pliability and strength for conversion into yarns and fabrics. Before fibres can be spun and woven into cloth, the raw material has to be subjected to certain preparatory treatments. Fibre preparation is essential for the good quality of the finished yarn and, ultimately, the cloth itself. Due to their distinct properties, flax and wool require different procedures and tools to make them usable in textile production. During the long chronological period considered in this volume, two basic fibre groups, divided on the basis of their origin into plant and animal, were used in textile manufacture.

Plant Fibres

Plant fibres are derived from various plant parts such as seed, leaf, bast and bark, and include fibres from flax, hemp, nettle, esparto, cotton and trees such as lime/linden, oak and willow. Plant fibres constitute the earliest textile material used by human beings (Soffer *et al.* 2000a). Tree-bast was more important during the Neolithic period, although it occasionally appears in the later periods (Rast-Eicher 2003, 48–50). Flax was by far the most important



Fig. 0.2. Field of flax in southern England (Photo E. Kokorin).

plant fibre in European prehistory (Fig. 0.2). Flax fibres are strong, resistant and have an excellent ability to absorb moisture (Harris 2010, 105–106). Cotton (Fig. 0.3) arrived in Europe only during the 1st millennium BC and remained quite rare throughout most of the period considered here (Barber 1991, 32).

Flax preparation is time-consuming and employs a variety of tools, which did not change significantly until industrialised processing was developed in modern times (Moore 1922, 82–83; Barber 1991, 13–14). Before the plant becomes over-ripe, flax plants are pulled up by the roots and gathered into bundles. The later the flax is pulled, the tougher the fibres will be. Yellow, or ripe, flax is occasionally used for utilitarian fabrics and ropes which require strength.

Once dry, the stalks are ripped to remove seed capsules. Then, they must be retted in standing or running water or dew in order to rot away the pectin that holds the fibres together. The retting can take from a few days to several weeks, depending on the method used, and has to be closely controlled in order for the fibres not to be weakened or destroyed. Using shallow water pools where



Fig. 0.3. Cotton (*www.cepolina.com*)

water is warmed by the sun can speed up the process, as a higher temperature increases the rate of decomposition. We know from Pliny the Elder (*NH* 19.17) that, at least during the Roman period, the advantages of warm water were known.

Once the stalks have dried they must be broken in order to loosen the pith from the fibres. In recent times, the process of breaking flax by foot has been utilised in some areas of northern Europe. Such a procedure would not require any tools. Thereafter, the flax is scutched with a broad wooden knife to remove the broken pith from the stalk. Finally, the fibres are hackled with a tool that has long teeth to remove the remaining pith.

The tools used for flax preparation were often made of wood and only a few these tools survive in the prehistoric contexts in Europe. The few surviving tools believed to have been used for flax preparation are scutching knives and flax combs recovered from Neolithic – Bronze Age lake-dwellings in the Alpine region (Bazzanella *et al.* 2003, 138 and 236). The process of flax preparation, thus, is better known from ethnographic examples and experimental archaeology (Rast-Eicher and Thijsse 2001).

Animal Fibres

The major animal textile fibre of antiquity

was sheep's wool (Fig. 0.4), with the occasional use of goat hair and other, more unusual fibres, such as horse hair (cf. Žeiere, Wincott Heckett in this volume). Wool has properties that differ markedly from plant fibres, which account for its widespread use soon after its adoption during the Neolithic (Harris 2010, 107–108). Its fibres have a scaly surface, which accounts for wool's ability to felt. They are also kinky, producing air pockets between the kinks and thus making wool an excellent insulating material. Wool fibres stretch more easily than bast fibres and hence the fabrics made of them are elastic, making it a much more suitable fibre for twill weave, which developed during the Bronze Age and became the predominant type of weave during the Iron Age in most of Europe. Unlike plant fibres, which are white-grey and are generally difficult to colour, wool comes in a variety of shades naturally and can be easily dyed a multitude of bright colours.

Textile research has demonstrated that several distinct wool qualities were used in prehistoric times, some of them simultaneously. Fibre quality studies have been useful in elucidating the development of various ancient fleece types. Michael Ryder established an evolutionary scheme for wool development based on fibre diameter measurements (Fig. 0.5; Ryder 1964; 1969; 1983). He hypothesised that, over the course of time, selective breeding has produced increasingly finer and more uniform wool. Thus, early varieties of sheep had coats containing a higher percentage of coarser hair and kemp than fine underwool. Woolly sheep are believed to have developed already by the middle of the 4th millennium BC (Ryder 1983).

Wool had to be removed from the animal, which could be accomplished by plucking or shearing. Plucking was an older method, used on primitive breeds of sheep whose fleece moulted. In some areas, the practice survived until the Roman period, although it had probably disappeared almost everywhere in Europe by the 1st century AD (Wild 1970, 23). The practice exists to this day in the Shetland Islands, where it is known as rooing (Christansen 2004, 12–13).

More developed sheep breeds do not moult and their fleece has to be cut off, a process accomplished with the help of shears or a knife. Shears appeared during the Iron Age and all of the examples known are iron (Fig. 0.6). In fact,



Fig. 0.4. Sheep flock (Stark Hollow Farm).

their invention is tied to the use of iron, which is more springy than bronze (Forbes 1956, 8; Barber 1991, 29). It is possible that, before the appearance of shears, knives were used for the purpose. However, since they could be utilised for a variety of other functions, it is impossible to prove that certain knives were used specifically to shear wool. Shearing is done in the late spring or early summer, when the new spring wool starts growing and can easily be distinguished from the winter wool.

All ancient shears found in Europe are of the same design, with two triangular blades (knives) on a simple U-shaped spring (White 1967, 119–120). Their size ranges from 10 to 25 cm in length. The optimal size of the blade is about 15 cm (Wild 1970, 22; Alfaro Giner 1984, 41). The same type of wool shears is still used today in some areas. Since similarly designed shears were also used for other purposes in antiquity, alternative functions for the ancient shears cannot thus be excluded.

The quality of a finished textile greatly depends on how well the fibre was prepared. The wool, hence, has to be sorted, which is done by hand and is highly time-consuming. The fineness of some of the ancient textiles demonstrates that the procedure was a regular practice in ancient times. The criteria for sorting may be colour, fineness, crimp, length, strength, or texture (Leadbeater 1976, 21–26). The quality of wool greatly depends on the part of the animal from which it derives, the sides and the shoulder area being the best. Furthermore, there are differences in quality even between different animals of the same breed and between male and female animals. The quality is also affected by the age and physiological state of the animal, such as whether a ewe has lambs or if the animal is sick (Andersson 2003, 17–18).

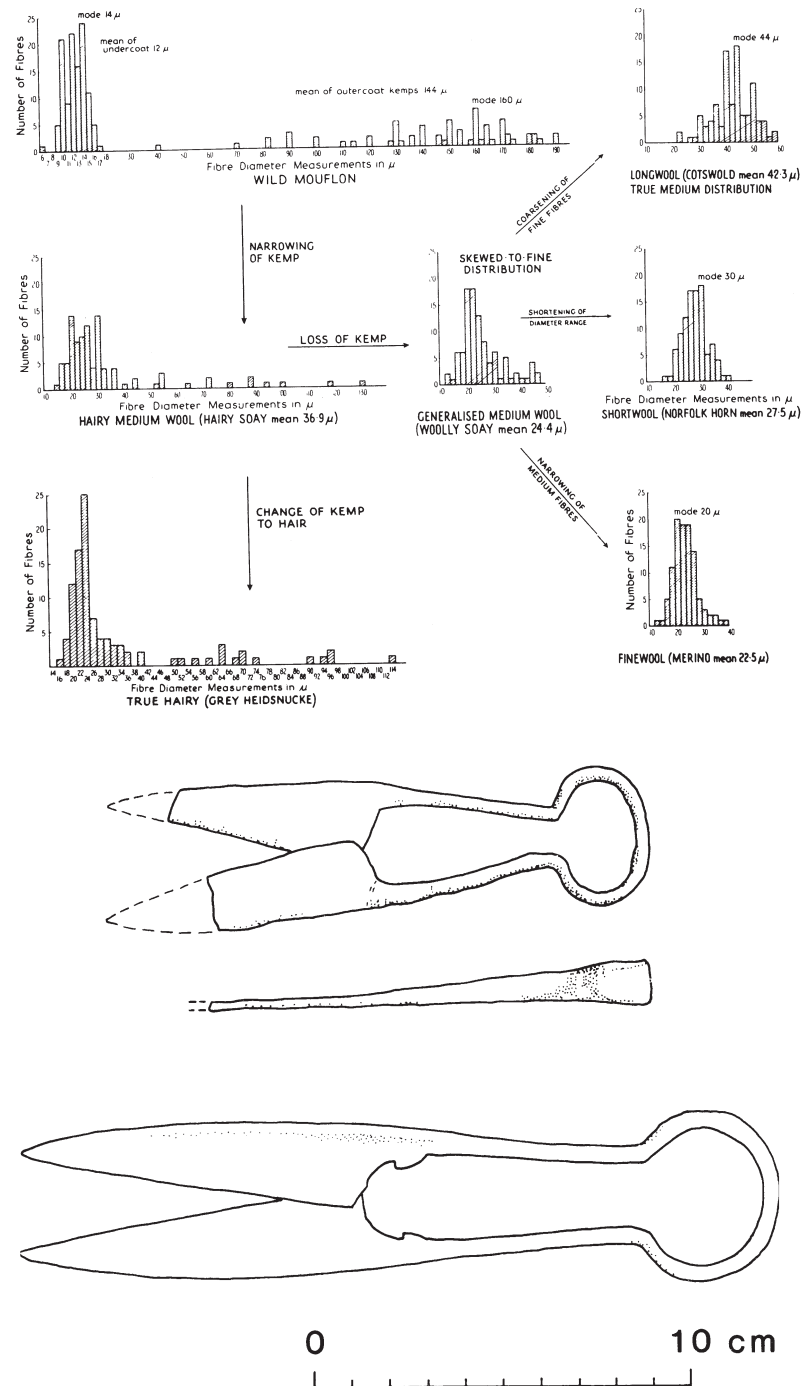


Fig. 0.5. (top) Changes in fibre diameter distribution during sheep fleece evolution (After Ryder 1983).

Fig. 0.6. (above) Wool shears (After Wild 1988).

Although the wool can be spun immediately after it has been plucked or shorn from the animal, it is usually first teased by hand or combed to remove impurities. Combing also straightens and arranges the fibres and separates the long hairs from the wool. Hackles and combs with long teeth were used for the purpose (Fig. 0.7). Wool combs in ancient times

Fig. 0.7. (left) Wool comb reconstruction based on a Bronze Age find from Caucasus (Photo: Centre for Textile Research).

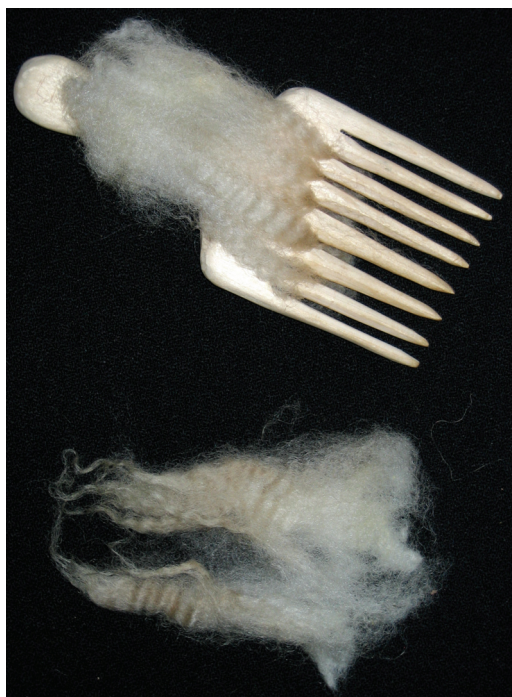


Fig. 0.8. (right) Silk cocoons in a silk workshop in Istanbul, Turkey (Photo: M. Gleba).



were made of wood, bone or horn. Many examples survive, but more research needs to be done on various types of excavated combs in order to assess if they were used for the purpose of wool preparation.

Another process, carding, was probably not used until Roman times. Carding introduces air into the wool and removes dirt and tangles, helping to produce consistent yarn. The commonly held view that early carders were probably made with dried teasels (*Dipsacus fullonum*), whose prickly heads have flexible bristles with hooks, is not plausible. Rather, they may have been used for raising the nap on the surface of a textile (Goldmann 2007).

The prepared wool was often in the form of roving, which is rope-like in appearance. In most cases, wool was spun unwashed, since the lanolin, naturally present in the coat, helps in the process. Occasionally, however, it was scoured to remove impurities, which could constitute up to 40% of the wool's weight (Wild 1970, 23; Morel 1978, 108). Ancient scouring agents were urine or soapwort. The wool had to be washed/scoured if it was to be dyed before spinning. Sometimes this was done 'on the hoof', i.e. sheep were washed in natural bodies of moving water, such as rivers and streams, which could also be "manipulated by dams and channels... creating artificial pools to facilitate

the procedure" (Santillo Frizell 2004, 83). However, wool could also be washed after it had been removed from the animal. Natural water sources were probably used for the procedure but occasionally special installations were built. The identification of such installations in archaeological contexts is problematic, however, since similar constructions were used for other purposes.

Silk, another historically important animal fibre, did not come into common use in Europe until Roman times (Fig. 0.8). It was long thought that silk was used in Europe already as early as the 6th century BC, based on the finds of Hohmichele and Hochdorf in Germany, and Athenian Kerameikos in Greece (Hundt 1969; Barber 1991, 32). The recent re-examination of these finds, however, casts doubt that the material is silk (Banck-Burgess 1999 and in this volume; Margariti *et al.* 2010). An unusual animal fibre, byssus or sea-silk, derived from the filaments secreted by the mollusc *Pinna nobilis* L., was also used in antiquity, although there is no direct evidence of its use before the late Roman period (Maeder 2002; Maeder *et al.* 2004).

Finally, a fibre derived from a mineral amphibole known as asbestos was occasionally used in antiquity (Fig. 0.9; Pionati Shams 1987, 3–11). It had a unique quality of withstanding

extremely high temperatures, and was used for making funeral shrouds, napkins, lamp wicks, and fishing nets.

Making a Yarn

Spinning

Once the fibre mass has been prepared, it can be converted into yarn through twisting and drawing out, or drafting the fibres – the process known as spinning (Fig. 0.10; Forbes 1956; Ryder 1968; Leadbeater 1976; Crockett 1977; Barber 1991, 39–78). The fibres can be spun or twisted in two directions, producing different structural effects. For convenience, yarn is described as z-twisted if it is spun clockwise or s-twisted if spun counter-clockwise (Fig. 0.11). The angle at which the fibres lie indicates whether the yarn was spun tightly or loosely. The tightness of the thread twist may also be measured in twists per centimetre. The fineness or coarseness of the yarn is indicated by its diameter measurement (in mm), which can also provide information about the weight of the spindle used to produce it. Two or more threads may be plied together to produce thicker and/or stronger yarn (Fig. 0.11). This is done by twisting two threads together, usually in the direction opposite to that of the original spinning. Thus, s-twisted yarn is usually Z-plied and vice versa. Further twisting of plied threads is called cabling. The twist direction may have been culturally determined in some areas during certain periods (Bender Jørgensen 1992, 13).

Spindle

In order to control the fineness and evenness of the thread, the fibres must be drawn and twisted simultaneously and with the same speed. The suspended or drop spindle accommodates all these requirements very efficiently. The type of spindle used in ancient Europe was a low-whorl spindle, in which the whorl was attached to the lower end of the spindle rod. The alternative, high-whorl spindle was used in Egypt and parts of the Near East and may have come into use in Europe in Roman times with the immigration of eastern populations. The two techniques may have overlapped in Anatolia, where ‘middle-whorl’ spindles have been found (Barber 1991, 60–61).

A spindle is a simple rod with a hook or dent on one end to attach the thread and to keep the yarn from slipping off the spindle shaft.

In most cases, it was a simple indentation in the wood, but occasionally a special element was added for the purpose, a spinning hook. The hook is an object made of a thin sheet of metal shaped into a cone and ending in a solid hook c. 5 cm long, which can be mounted on a wooden spindle shaft. Spindles were usually made of wood or bone and therefore they rarely survive in archaeological contexts. In addition, there are examples made of metal and other precious materials, all of which have been found in burial contexts. Length is an important parameter in a spindle since it determines the ease of its use. Spindles range in length from 12 to 27 cm (Ryder 1968, 79), although occasionally, examples of up to 40 cm long have been found.

Spindle Whorl

The most common evidence for the use of spindles consists of the less perishable spindle whorls (Fig. 0.12). A spindle whorl provides weight and tension for spinning fibres into thread (Ryder, 1968; Crewe 1998, 5–8). A spindle whorl is a symmetrical, centrally pierced object. The vast majority of spindle whorls are made of fired clay but wooden, bone and stone whorls are also known. Whorls made of luxury material such as glass and amber have been found in burial contexts.

Spindle whorls, often in large numbers, are present practically at every settlement site in Europe starting from the Neolithic period. A variety of whorl shapes are known; this may be due to a relationship between the shape of the whorl and the speed of spinning and the tightness of the twist. A smaller diameter will cause the whorl to rotate faster and, therefore, to produce a tighter twist than could be accomplished with a wider whorl of the same weight (Keith 1998, 509). Hence, different whorls were required for different types of yarn. Overall, since these shapes do not change dramatically over time, whorls are practically impossible to date unless they come from a datable context or have a specific decorative scheme.

The shape of the whorl does not influence the yarn significantly. More important is the ratio of diameter to height, which affects the speed with which the spindle rotates. Whorls with a high ratio (like those with a discoid or lenticular shape) will rotate more slowly but for a longer period, while whorls with a low ratio

will rotate fast but will soon lose their velocity and will have to be restarted.

The weight of the whorl is a significant feature and can indicate the quality, and, sometimes, the type of fibre being spun and the quality of the thread produced (Ryder 1968, 81–82; Parsons 1975; Barber 1991, 52; Grömer 2005, 109). For fine, delicate threads, small, light whorls are used during spinning (Liu 1978, 99). On the other hand, for stronger, coarser fibres or for plying, heavier whorls are needed. The recorded upper limit for the weight of a whorl is 140–150 g (Liu 1978, 90; Barber 1991, 52). The smallest spindle whorls known come from the Middle East during the Islamic period, when implements as small as 0.8 cm in diameter and under 1 gram of weight were used for spinning cotton (Liu 1978, 90–91). Spindle whorls fall within a certain range of weights for spinning particular types of fibre. Thus, to spin full-length flax or to ply yarns, heavy spindles weighing 100–150 g are used. On the other hand, short wool, flax tow or cotton, are spun with a light spindle. The weight of the spindle used for short fine wool is about 8 g, while for the medium to heavy wool it is approximately 30 g (Ryder 1968, 81; Barber 1991, 52). By knowing the range of whorl weights at a particular site, one could infer the types of fibre and yarn being spun there. In order to make such estimates possible, it is essential that the excavators publish the weight measurements.

Another important feature of a whorl is the diameter of the hole for the spindle rod. The hole must be large enough to accommodate the shaft. The expected range of the hole diameter for spindle whorls is 0.3–1 cm (Liu 1978, 97).

The essential rotational parameters of spindle-whorls (shape, diameter, mass, height and hole diameter) can be condensed into the single numerical value of the moment of inertia, which enables the visual comparison of rotational properties of different spindle whorls (Verhecken 2010).

Distaff

During spinning, raw fibre could be held in the hand or fastened to a distaff. Short, hand-held distaffs were used for spinning short-stapled fibres, while longer ones, held under the arm or in a belt, were used for longer fibres. Distaffs were usually made of wood; even a

simple forked stick would have been sufficient for the task. Considerably less frequent were items made of metal, such as, bronze, iron, silver, and precious materials like glass and amber. Yet, while wooden tools rarely survive in archaeological contexts, numerous examples of objects identified as distaffs made of luxury materials have been found in burials (Gleba 2008). Such distaffs most likely functioned as status symbols.

Splicing

An alternative technique to create yarn was splicing (Fig. 0.13). In this technique, the ends of pre-formed bundles of flax fibre, 60–90 cm long, stripped from their stalks were spliced, so that the ends of the fibres would overlap in bunches and then only at considerable intervals (Barber 1991, 47; Granger-Taylor 1998; Kemp and Vogelsang-Eastwood 2001, 70–80). The ends of the bundles overlapped by a few centimetres and were twisted at the splice so that it would hold. Splicing is a technique particularly associated with Egypt and it is present in some of the earliest Egyptian linen textiles (Barber 1991, 145), but has also recently been identified in Neolithic Swiss textiles (Leuzinger and Rast-Eicher 2011). It appears to have been one of the earliest yarn-making technologies used by the prehistoric inhabitants of Europe.

Making a Textile

Once the fibres have been spun or spliced into yarn, they can be woven into a two-dimensional structure. Two classifications of textiles exist at present: one based on finished structures, *i.e.* the way the threads interlace (Emery 1966), and another on techniques (Seiler-Baldinger 1994). A textile can be created by a variety of techniques. The fibres can be matted without forming a yarn, creating non-woven fabrics such as felts (Forbes 1956, 89–92; Barber 1991, 215–222). The earliest textile techniques were non loom-based and consisted of manipulating yarn in some way so as to create a web-like structure. These techniques are generally referred to as plaiting (Seiler-Baldinger 1994, 6). They can be made by hand or by using very simple tools such as sticks or a needle. Linking, looping and knotting produce mesh-like fabrics with a single continuous thread or element (Fig. 0.14).

More complex techniques employ two or



more sets of elements, some of which can be passive. The passive system is generally called warp. The perpendicular active or movable system is called weft. Thus in twining, one of the earliest techniques, a passive system of threads is twined together with two or more elements of an active system (see Médard in this volume). The active elements are worked into the passive system manually. Sprang is created by twisting adjacent parallel threads (Fig. 0.15; Hald 1980, 245ff; Barber 1991, 122; Collingwood 1974), resulting in highly flexible and stretchable cloth, a characteristic equally useful in clothing or for other utilitarian purposes.

Tablet Weaving

Tablet weaving is a common technique to make braids but was also popular for making decorative borders (Fig. 0.16; Collingwood 1982; Seiler-Baldinger 1994, 73–76; Ræder Knudsen 2010). Tablet weaving involves passing threads through holes in the corners of (usually) square tablets, which, when rotated forward or back, force the threads to form different sheds. By rotating cards in different combinations, it is possible to achieve various patterns. This method is suitable for weaving narrow bands, such as belts, starting borders for the warp of a warp-weighted loom, or decorative edges added to the ground weave. Among the surviving tools that may have been utilised in tablet weaving are tablets, terracotta spools, metal clasps and combs as well as bone spacers with pegs (see Ræder Knudsen in this volume). Tablets themselves, having been made of wood, bone or hardened leather, rarely survive.

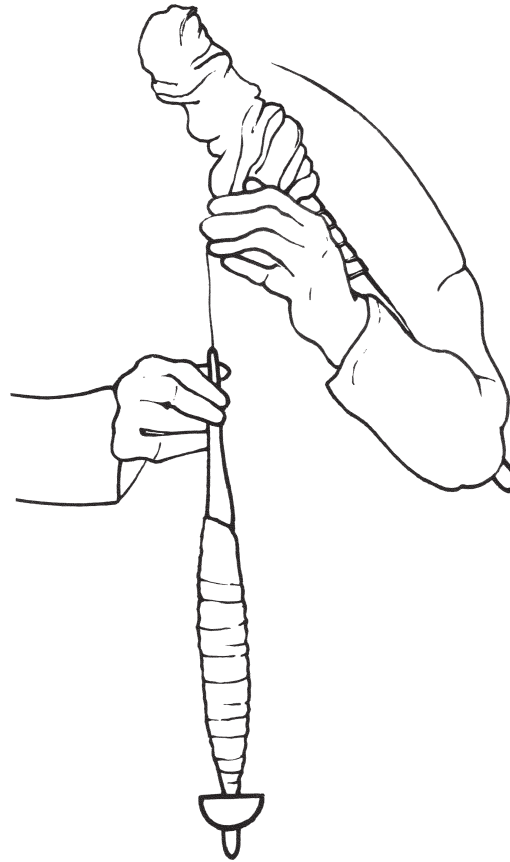


Fig. 0.9. (far left) Asbestos with muscovite (http://en.wikipedia.org/wiki/File:Asbestos_with_muscovite.jpg).

Fig. 0.10. (left) Spinning with drop spindle and distaff (Drawing: Annika Jépsson).

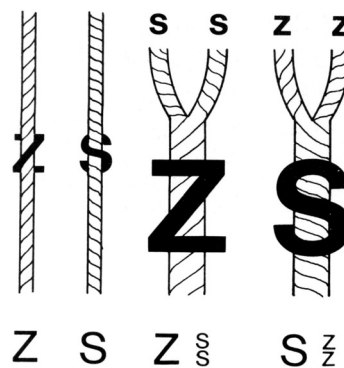


Fig. 0.11. Spins: z-spin, s-spin, Zs-ply, Sz-ply (After Bender Jørgensen 1992, 15 fig. 2).

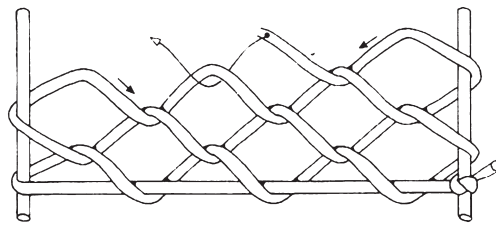


Fig. 0.12. Spindle whorls from Poggio Civitate, Italy, 6th–7th century BC (Courtesy of Anthony Tuck).

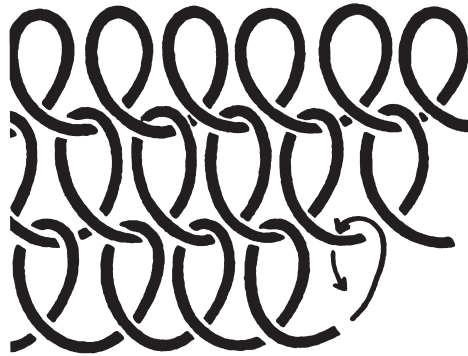


Fig. 0.13. Splicing of flax fibres (After Barber 1991).

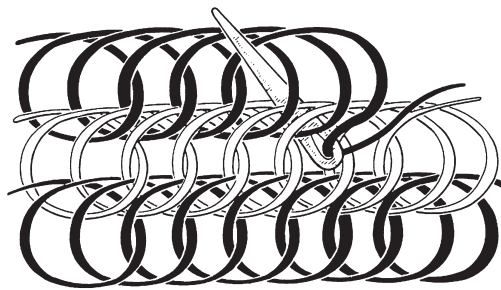
Fig. 0.14. Linking, looping and knotless netting.



Linking

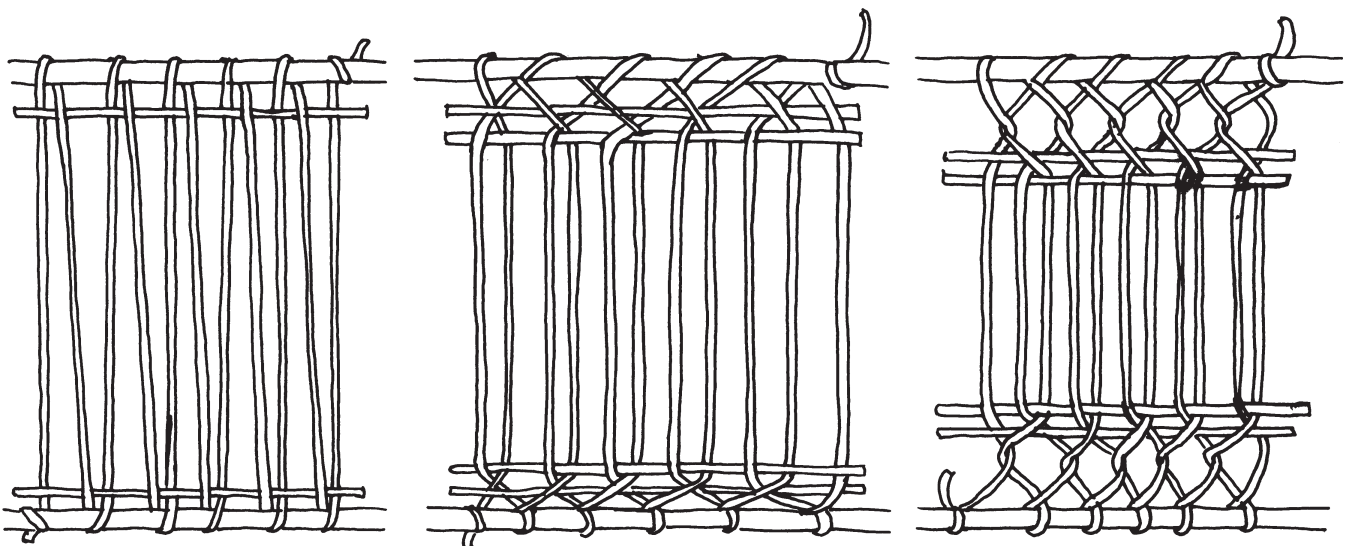


Simple looping



Knotless netting

Fig. 0.15. (below)
Successive stages of
creating sprang (courtesy
of Eva Andersson
Strand).



Weave

A woven textile is also constructed by interlacing a passive and active thread system at right angles. The process is generally automated (see below). The textile is then defined in terms of its weave structure.

The simplest form of weaving, plain weave or tabby is produced by weft threads passing over and under alternate warps (Fig. 0.17). When the weave is balanced, *i.e.* warp and weft have approximately even amounts of threads of the same diameter, it is called a balanced tabby. When one of the systems is denser, the tabby becomes warp-faced or weft-faced. In rep, one of the systems has a considerably higher thread count, normally, a ratio of 2:1. Rep can also be termed warp-faced or weft-faced if warp and weft can be determined. If the warp and weft are paired, the resulting binding system is a basket weave; if only one system is paired, it is a half-basket weave or extended tabby.

In the more complex, twill weave, weft threads pass over and under warps in a regular staggered pattern, each row being stepped to one side of the row above (Fig. 0.18). This creates a diagonal effect. If the weft thread passes under two and over two warp threads, it is described as a 2/2 twill. The variants include a plain diagonal, warp- or weft-chevron, broken and more complex diamond and lozenge twills. If the weft thread passes under two and over one warp thread, the weave is called a 2/1 twill (also known as three-shaft twill), and if it passes one and over two, a 1/2 twill. If no intact edge is

preserved, it is often impossible to differentiate between the two. Here, chevron and diamond variants are also possible.

Pattern-making possibilities may be further exploited by 3/1 twills and satins, which produce weft- and warp-faced effects (Fig. 0.18). Compound weaves include multiple sets of wefts and/or warps. Thus, block damask is a 3/1 – 1/3 twill. A samitum is a weft-faced compound twill, in which the warp threads are hidden on both sides of the fabric by the ground and patterning wefts. Satin weave on the other hand is warp-dominant and forms a minimum number of interlacings, resulting in a very glossy fabric.

Extra wefts may be worked into the basic weave to produce brocade and, hence, complex patterns. This is a weaving technique well known in Bronze Age Central European textiles (Barber 1991, 139). Weft-wrapping or soumak is another technique that superficially looks like embroidery and is also known as weft wrapping or ‘snare-weave’ (Seiler-Baldinger 1994, 57). The flying thread or floating weft technique is another technique to create patterns (*cf.* Grömer in this volume).

Another supplementary technique used for decoration, tapestry, utilises several coloured wefts, which do not pass from selvedge to selvedge but are woven into blocks of colour. Looped textiles are made when threads in one of the systems are not interlaced tightly but allowed to remain loose as protruding loops. Piled textiles, such as carpets, include fabrics of various weaves with extra threads inserted by knotting.

Patterning, however, was not always dependent on a complex weave structure, but could be formed using yarns of different colours, spin directions (spin or shadow pattern), or thicknesses. Depending on the yarn diameter and on how densely the threads are packed in each system, the weave can be denser or more open. The thread count, that is the number of threads per 1 cm in each system (threads/cm), often indicates the density and fineness of a textile.

The presence of a border or selvedge is very important in textile analysis (Fig. 0.19). Before weaving could begin, the warp had to be prepared separately from the loom or on the loom. Starting borders or heading bands are characteristic but not exclusively used for textiles woven on a warp-weighted loom. Such

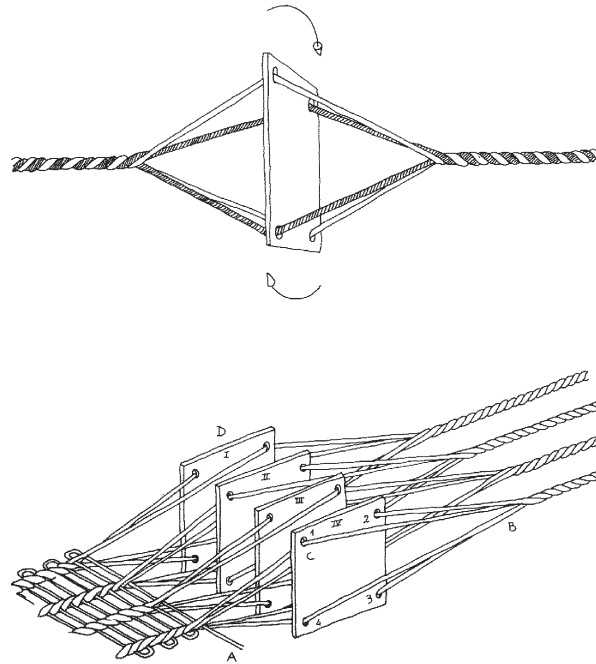


Fig. 0.16. Tablet weaving (Courtesy of Lise Ræder Knudsen).

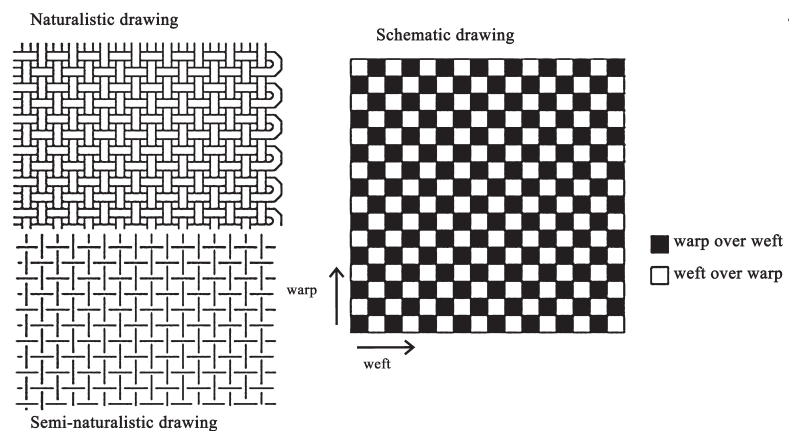


Fig. 0.17. Tabby drawn in three styles (After Walton and Eastwood 1983).

border can be a cord, a tabby strip, or made by plaiting or tablet weaving (Forbes 1956, 192–194; Wild 1970, 63–64; Barber 1991, 116–118). Selvages are formed by the turning of the weft on itself at the edges of the warp and can be simple or more complex. They can be reinforced with extra threads or cords, or made in a different and more complex structure than the ground weave. The lower edge of a textile may be finished into a fringe or a cord, sewn back into the fabric, tablet-woven, or left loose. Fringes may be knotted, plaited, twisted, interwoven or finished with tassels.

Fig. 0.18. Textile weaves.

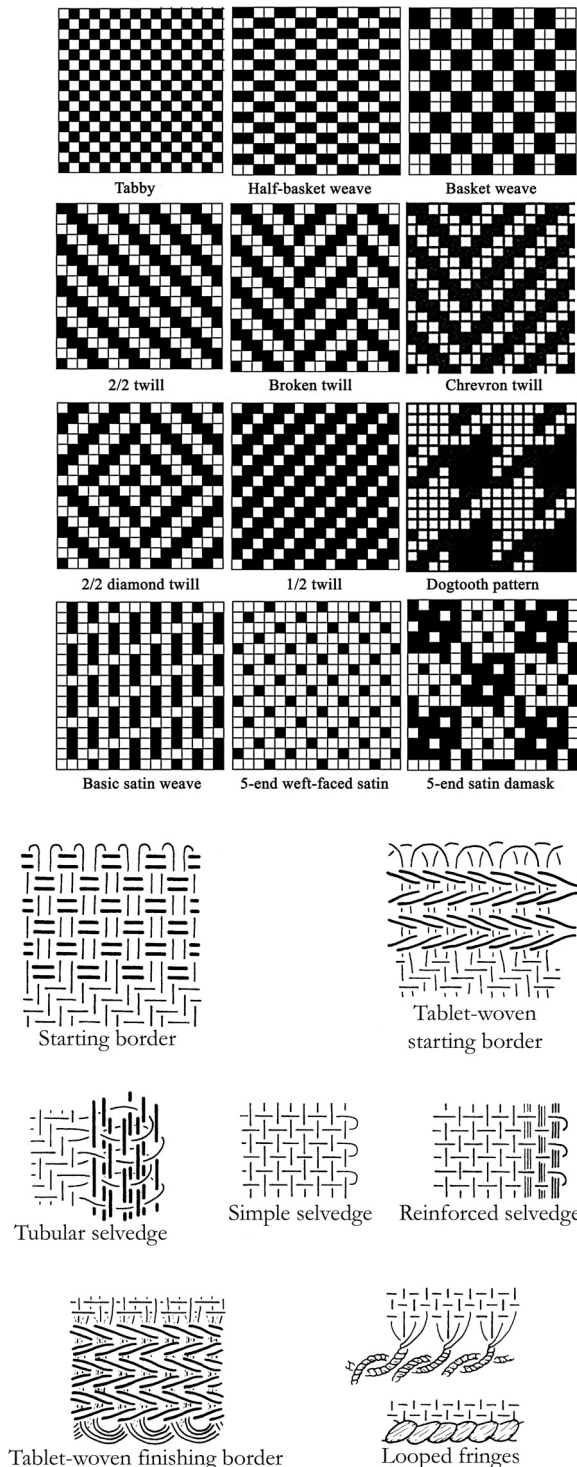


Fig. 0.19. Starting borders, selvages and finishing borders (After Wild 1988).

Loom

Weaving is accomplished on a loom, a special frame that keeps the warp system in place, while allowing the weft to be passed in between warp threads. Generally, a loom provides some degree of mechanisation or automation of the weaving process.

The simplest of these devices, the back-strap loom, is a tension loom, usually with the tension provided by the body of the weaver (Broudy 1979, 76–80). The warp is stretched between some stationary object such as a tree or a hook in the wall of a house and the body of the weaver. The tension is created by the weaver leaning back against a belt that is attached to both ends of the cloth beam.

Warp-Weighted Loom

North of the Mediterranean, one of the main loom types used in prehistoric times was a warp-weighted loom (Fig. 0.20; cf. Crowfoot 1940; Forbes 1956, 199–202; Hoffmann 1964; Wild 1970, 61–68; Barber 1991, 91–113). The earliest evidence for this type of loom consisting of loom weights has been found in Hungary and is dated to the late 7th millennium BC (Barber 1991, 93). The earliest representations of such a loom are seven depictions carved into the Great Rock of Naquane in Val Camonica, Italy dated to the Bronze Age (cf. Bazzanella in this volume). A warp-weighted loom is made of two upright beams that stood at a slight angle to the vertical plane and a single horizontal or cloth beam, to which the warp is attached. In a warp-weighted loom, as suggested by its name, the warp is kept taut by the weights attached at the bottom to groups of threads. Since weights were most often made of stone or clay (Hoffmann 1964), they survive well in archaeological contexts and allow us to trace the presence and sometimes even location of a warp-weighted loom on sites (Fig. 0.21). Another kind of evidence for the warp-weighted loom consists of postholes, which may indicate the total width of the loom and the angle at which it was positioned with respect to the wall. Archaeological and representational evidence suggests that the main upright portion of this loom was probably braced at an angle against a wall or a post, an arrangement that uses gravity, with a shed bar at the bottom to separate the threads into a shed (Barber 1991, 103).

A tabby weave is created on a warp-weighted loom by dividing the warp threads in two groups by pulling every alternate thread and inserting a rod or shed bar between the two groups in such a way that one of the groups is in front of it. Such a position creates a natural or open shed through which the weft can be passed all at once. The artificial or counter shed is then

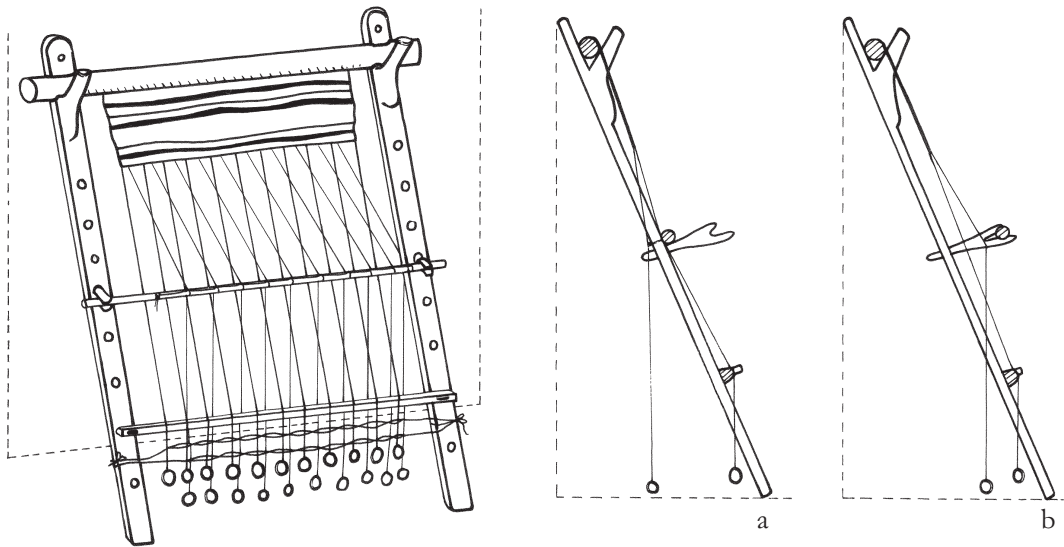


Fig. 0.20. Warp-weighted loom and its position with: a) natural shed; b) artificial shed (Courtesy of Eva Andersson).

achieved by providing the back set of warp threads with heddles, or individual holders, usually made out of string for each individual warp end thread, which are attached to a heddle bar. When the heddle bar is lifted, it separates the threads in the direction opposite to the natural shed. Additional heddle bars allow multiple sheds and, hence, the mechanised weaving of more complex patterns, such as twills. In a warp-weighted loom, the weaving started at the top, hence the weft had to be packed upwards.

In order to increase the length of the cloth being woven, either the loom could be very tall or the weaver had to become 'taller'. Usually, however, the height of the loom probably did not exceed human height, *i.e.* 165–180 cm. Standing on a stool or a bench would therefore be the simplest way to accomplish the task. Another way to increase the length of the cloth could have been by digging a trench under the loom, as depicted on the famous vase from Sopron, Hungary (see Grömer in this volume). Trenches linked to weaving on the warp-weighted loom have been found in central Europe (Dobiat 1990, 73 Fig. 1b, 84 Fig. 6). The most commonly used solution, however, was to make the cloth beam a roller so that the cloth could be wound on it as it was being woven.

Loom Weights

It is not always easy to demonstrate that the weights found in an archaeological context were indeed used for weaving, unless they are



Fig. 0.21. Loom weights from Poggio Civitate, Italy, 6th–7th century BC (Courtesy of Anthony Tuck).

found in rows (Wild 1970, 62; Barber 1991, 92–93). Similar objects have been shown to be used as weights for holding down roof thatching, for tying sacks, as fishnet weights, or as supports for holding a spit over fire (Wace and Thompson 1912, 43 Fig. 19; Barber 1991, 97 note 11). Another hypothesis is that they were used as supports for the full spindle to facilitate the unwinding of the spun thread onto a spool or into a ball (Buchner and Rittmann 1948, 40, Fig. 9). Ring-shaped weights are often associated with the hearth and identified as supports for cooking pots.

The vast majority of loom weights were made of fired clay, although stones could also be used (Hoffmann 1964). The manner in which the weights were attached to the warp is still debated. Most likely the threads were tied, not to the loom weight itself, but to an intermediary device such as a metal ring, a cord, or a bar which may have attached the loom weights to each other to keep them organised.

A set of loom weights is typically composed of 6 to 30 implements, although it could reach

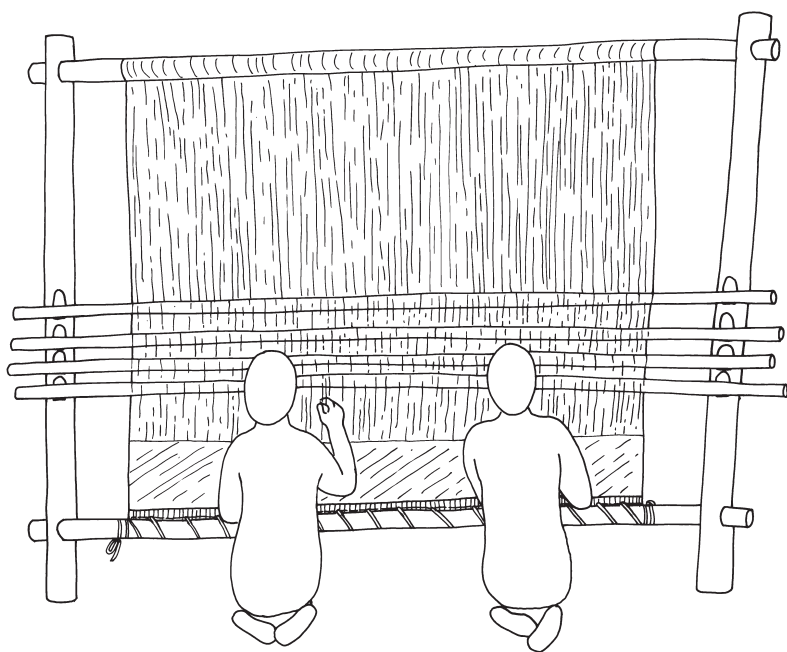


Fig. 0.22. Two-beam vertical loom (Drawing: Annika Jépsson).

as many as 80 (Barber 1991, 104). Fewer loom weights would be needed if they are heavy, and more if they are light. The evidence for these numbers is provided by ethnoarchaeology and by the configuration of loom weights occasionally found *in situ*, having fallen to the ground when the warp to which they were originally attached was destroyed or deliberately cut. Such loom weight series not only provide an idea of the number of loom weights utilised in a loom but also permit the reconstruction of the exact orientation and the width of the loom, which, in turn, can be used to speculate on the size and quality of the textile being woven (*cf.* Belanová Štolcová in this volume). The number of rows may also indicate the number of sheds, and hence the complexity of the weave. The pattern of distribution of the loom weights can also be useful in providing information about the location of textile-producing activities within the settlement. The degree of uprightness and the height of a warp-weighted loom, as well as the distribution of the weights must be considered when attempting to suggest a possible location for looms in houses.

Weight and thickness are the most important functional features of a loom weight (Mårtensson *et al.* 2009). Overall, they vary in weight from less than 100 g to a few kilograms. The number of threads attached to each

weight varies depending on the weight, type of fibre, thread diameter and type of weave.

Vertical Two-Beam Loom

An alternative to a warp-weighted loom was a vertical two-beam loom, in which the warp is stretched between two horizontal beams (Fig. 0.22). In contrast to the warp-weighted loom, where the weaving proceeded downwards and the weaver usually worked standing, in the two-beam loom, the weaver sat and packed the weft downwards. Being made entirely of wood, this type of loom is known only through representations and is difficult to trace archeologically. Scandinavian Iron Age textiles found in bogs provide further evidence of two- or multiple-beam looms as they had been created with a tubular warp (*cf.* Mannering *et al.* in this volume).

Horizontal Loom

In a horizontal ground loom, the warp is stretched between the two beams which are fixed in place by pegs driven into the ground, and the weaving is accomplished seated on the ground (Fig. 0.23). The use of the horizontal ground loom in Europe has only been hypothesised on the basis of the possible Hallstatt-period depiction from Rabensburg (see Grömer in this volume; Fig. 1.24c). A special kind of horizontal loom may have been used for certain types of fabric (compound weaves) in Roman times (Wild 1987).

Shuttles and Beaters

During weaving, the weft thread was kept on a shuttle, which in its simplest form could have been a ball of thread or a simple stick, possibly the spindle shaft on which the yarn had been spun (*cf.* Barber 1991, 107). Shuttles were most likely made of wood or bone and survive only in exceptional circumstances. The weft was beaten together with a special implement (Wild 1970, 65–67). The tools used to beat the weft against the already woven part of the cloth are seldom known from the archaeological record, partly because they were most often made of perishable materials. Throughout Europe, a variety of implements were utilised for this purpose, including combs and special weaving swords and knives, made of bone, wood and occasionally even of iron. Large, bone needles could also be used for the purpose.

Finishing

After a textile has been created, it can be subjected to a variety of finishing processes. Linen cloth could be subjected to various rough treatments to make it softer or it could be rubbed with a special stone or glass piece to give it extra lustre (Wild 1970, 84–85). Subsequently, linen could be bleached and/or decorated in some way. Bleaching could be done naturally, by exposing cloth to the sun.

Wool fabric could be subjected to fulling, a treatment with water and sometimes soap that produces a very dense fabric. Fulling establishments used very large basins, examples of which have been discovered in Roman fulleries (*fullonicae*). The surface of a wool cloth could also be raised to produce a nap, which could have been accomplished with teasels (Goldmann 2007). Wool could also be bleached with a special sulphur treatment.

Pleating might have been another type of finishing process, applied to both linen and wool. During the Roman period, both literary and archaeological evidence exist for clothes-presses (Granger-Taylor 1987, 120). While no such sources are available for preceding periods, depictions of Etruscan garments in art indicate regular and often elaborate pleating of certain garments, particularly mantles. Textiles from Verucchio in Italy, dated to the 7th century BC provide the first direct evidence of such practice (see Stauffer in this volume).

Sewing

A textile could be sewn into a garment, although the majority of ancient European textiles were used straight off the loom, that is, they were wrapped around and fixed on the body using devices such as pins and belts (but see Gleba and Krupa in this volume).

In sewing, seams and hems represent the structural elements of stitching. Structural sewing refers to the various ways of joining or finishing textiles. Also included in this category are repairs such as mending, darning and patching. Running, hem and overcast stitch were commonly used for sewing in the past (Fig. 0.24). Skin and leather could also be sewn to make garments (see Mannering *et al.*, Wincott Heckett in this volume).

The tools used for sewing are needles, characterised by one pointed end and an eye at the other, and used to pass thread through fabrics and skin to reinforce, mend or join

articles together. Most extant needles found in ancient sites are made of bronze or iron. Metal gives strength and thinness, which are advantageous for the fine stitching of cloth and skin. In terms of size, metal needles usually do not exceed 10 cm in length. More often, however, needles were probably made of bone, a material that is less likely to survive in an archaeological context. Bone needles are often shorter and thicker than the metal ones, most likely to prevent breakage due to their brittleness.

Sewing was also used to decorate cloth by a variety of techniques. One of these is embroidery, which includes a number of stitches. Shells, seeds, beads and metal appliqués could also be attached to the fabric to create a decorative effect.

A special and rather costly type of decoration was made with gold thread, which was crafted either from thin gold wire or by winding very thin strips of gold (or silver) around an organic core. Gold thread could be incorporated into the textiles with different techniques. It could be simply woven in as brocade or added as an elaborate pattern in tapestry. It could also be used for embroidery, by itself to create hairnets utilising the sprang technique or to make cords and fringes by twisting several gold threads together.

Dyeing

The use of colour is probably no less ancient than the weaving of textiles themselves. In Europe, dyes were certainly used since the Bronze Age. The primary material to be dyed was wool. The simplest way of imparting colour onto any material is by staining, which could be accomplished using mineral pigments or with plant extracts and does not require any special equipment. True dyeing, on the other hand, is more complicated. Dyeing can be imparted in various ways (Cardon 2007). The simplest way is by immersing the finished cloth in a dye pot which results in the entire fabric being coloured. Raw fibres or yarn can be dyed for more complex polychrome weaves or embroidery. A textile can be resist-dyed by placing it in a dye vat after parts of it have been treated with a dye-resistant substance. Finally, patterns can be painted or printed on the fabric.

Mineral pigments, such as ochre, were probably the first materials used to transform

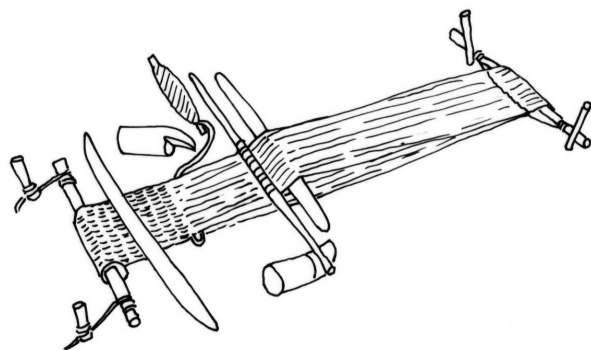
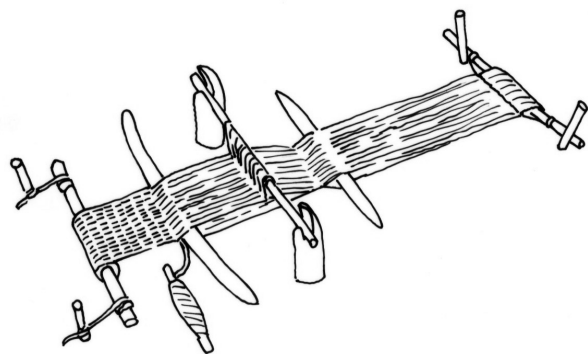
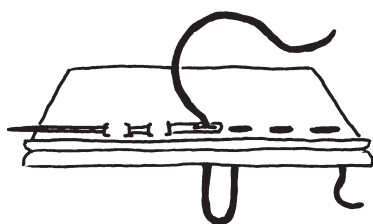
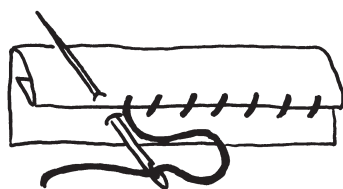


Fig. 0.23. Horizontal loom (Drawing Annika Jeppsen after Broudy 1979).

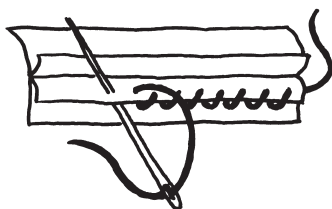
Running stitch



Hem stitch



Overcast stitch



Catch stitch

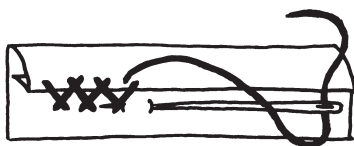


Fig. 0.24. Basic sewing stitches (After www.sewdress.com)

the colour of textiles. Pigments, however, are insoluble in water and do not chemically bind to the textile. As such, they cannot produce a long-lasting colour. Dyes, in contrast, are substances that can be chemically bound to a substrate, *i.e.* a fibre. Almost all dyes are organic materials. Direct dyes are water-soluble and can bind chemically to the substrate itself. These dyes are usually fugitive since the binding forces are relatively weak, deteriorating with time. Vat dyes, on the other hand, are generally water-insoluble and have to be chemically altered to a soluble and often colourless form (Lambert 1997, 73). Once the soluble form is bound to the fabric, treatment with air regenerates the original dye yielding a very stable or fast colour.

Most organic dyes require certain additional

ingredients to make them colourfast. In some cases, only the levelling agent is required. Depending on the leveller, dyes can be classified as acidic or basic. Acids were obtained by using vinegar (acetic acid) or by fermenting the dye plant. Basic dyes, on the other hand, were treated with ammonia or salt. Woad and indigo, for example, required reduction in an alkaline vat. Human or animal urine was often used for the purpose. Lime and potash, the latter made by leaching wood ashes, were other substances commonly utilised.

Certain dyes require a mordant in addition to or instead of the levelling agent. Mordants are also classified as acidic or basic, and acidic mordants are used to bind with basic dyes and *vice versa*. Acid mordants are generally derived from tannins available from tree bark (especially chestnut and hazel) and gall. Basic mordants come from salts of metals such as iron, chromium, aluminium, copper, zinc, or tin. Thus, purple needs tin or iron, while madder requires aluminium (Lambert 1997, 89). The mordant may be applied to the fabric before dyeing or it may be present in the dye bath. These salts are often ingredients of certain clays, such as alum, caustic soda, or natron. Scraps of metal could also be used in a vat. The presence of the mordant may change the colour of the dye and different mordants used with the same dye may produce different colours. Mordant dyes are usually colourfast.

Dye Sources

A variety of plants could have been used for dyeing (Cardon 2007). The colour blue could be obtained from woad (*Isatis tinctoria* L.) and Asian indigo (*Indigofera tinctoria* L.), both of



Fig. 0.25. Purple shells, from left to right: Murex or Haraplex trunculus, Stramonita haemastoma, Bolinus brandaris (Courtesy Carmen Alfaro Giner).

which contain the active ingredient indigotin. Indigo was probably not used in Europe until Roman times. Woad, however, was one of the earliest used dye plants in Europe. The dye was reduced in a woad vat, an anaerobic fermentation of treated woad leaves assisted by the microorganism *Clostridium isatidis* (Padden and John 2000). Recently, indigotin has been identified in the textiles from Hallstatt dated to the Middle Bronze Age (1600–1200 BC), making this the earliest instance of woad use in Europe (Hofmann-de Keijzer *et al.* 2007).

Reds and oranges were some of the most sought after and expensive colours. The root of dyer's madder (*Rubia tinctorum* L. and other similar species like *Rubia peregrina* L.), native to southern Europe, was probably the earliest and most commonly used. Its active ingredients are alizarin and purpurin. It was used and even cultivated already during the Bronze Age in some areas of the eastern Mediterranean (Nosch 2004). Kermes (*Coccus ilicis* and *Kermes vermilio*) and lac (*Coccus laccae*), products of small insects growing on varieties of scrub oak, produce the most brilliant reds. While kermes is common in the Mediterranean area, lac was imported from the Indian subcontinent and most likely reached Europe only during Roman times. An insect dye was, however, already used in some of the 6th-century BC textiles of Eberdingen-Hochdorf, Germany (Walton Rogers 1999, 241–243).

Yellows could be obtained more easily and from a larger variety of plants, such as weld or dyer's weed (*Reseda luteola* L.), saffron



(*Crocus sativus* L.), dyer's greenweed (*Genista tinctoria* L.), safflower (*Carthamus tinctorius* L.), and others. On the other hand, the flavones, active ingredients of yellow dyes are often less stable and are more difficult to identify in archaeological textiles. However, a large number of Early Iron Age textiles found in Danish bogs have tested positive for yellow dyes, which may have survived better in the special environment of the bog (Vanden Berghe *et al.* 2009).

Among ancient dyes, in a category of its own stands Royal or Tyrian purple, the most famous dye of antiquity, obtained from a variety of marine molluscs, such as *Hexaplex*

Fig. 0.26. Dye works in Morocco (www.cepolina.com).

trunculus (old name *Murex trunculus*), *Bolinus brandaris* (old name *Murex brandaris*), *Stramonita haemastoma* (old name *Purpura haemastoma*), and other species (Fig. 0.25). Its active ingredient and chemical tag is dibromoindigotin (Cardon 2007). Various molluscs produce different amounts of it with respect to the blue indigotin and red purpurin; hence, depending on the percentage of each species in the dye vat, the final shade could range from red to blue, purple being the most sought after colour. Purple production is usually associated with the Phoenician cities of the Levant, especially Tyre and Sidon, although the earliest archaeological evidence is found on Crete, dated to 1900–1800 BC (Cardon 2007, 441). The heaps of crushed mollusc shells throughout the Mediterranean testify to the scale of the industry in antiquity (Jensen 1961, 105–106; Barber 1991, 228–229; Alfaro 2002; Sagona 1999). Extant textiles dyed with shellfish purple are, however, very few and date predominantly to the Roman times. Due to the high value of true purple, it was frequently imitated by combining red and blue plant dyes or by using certain lichens. The earliest instance of purple dye use is currently documented in some mineralised textiles found at Qatna, Syria and dated to the Bronze Age (James *et al.* 2009).

In addition to the bright colours, often requiring expensive and rare dyes, a variety of shades could be obtained from plants common throughout Europe (Cardon 2007). Many trees produce tannin-bearing dyes, which are also used for the curing of hides. Thus, oak and sumac can be used to dye textiles yellow, brown, or black, while pine produces brown and yellow dyes. Galls and nuts were commonly used for brown. The berries of elder (*Sambucus nigra* L.) produce green or black colours. Blueberries, on the other hand, create a violet, pink, or blue-grey effect. River cane can be used to dye fibre green or yellow, and nettle yellow-green or gray-green. Lichens produce brown, yellow and purple shades.

Raw materials for the dyestuffs have to be ground in order to be used. Grinders, pestles, mortars and pounders constitute a category of tools which could have been used by a dyer in order to prepare dyes by crushing or grinding the raw materials. These objects, although frequently found at archaeological sites, are

rarely recognised as significant to the textile industry because they could have been utilised for other purposes, such as cooking.

During dyeing, relatively large vessels or vats are needed for dissolving or fermenting the colouring substance, as well as for immersing the fibres or cloth to be dyed (Fig. 0.26). In addition, the excess dye had to be extracted and salvaged somehow, especially in the case of more expensive dyes (Barber 1991, 240). Channels, drains or sieves may be used for the purpose. Finally, areas for rinsing and open spaces for drying are needed to complete the process, neither requiring any sort of special installation.

Dyeing facilities, especially the large-scale ones, tended to be located on the outskirts of settlements, due to unpleasant smells produced in the process of dyeing. Large quantities of water required for rinsing also necessitated that dye-works be located near a body of water. Very little work has been carried out on the functional identification of such installations, especially in pre-Roman times. A major problem is presented by the fact that similar structures were used for washing wool and cloth, fulling, tanning and other purposes unrelated to textile manufacture (*e.g.* Sagona 1999).

This general overview of the technical aspects of textiles demonstrates the complexity of textile production and underlines the importance of understanding the many different techniques by which they were created and decorated. Some of these techniques and characteristics are chronologically or geographically specific and can be used to trace the date or origin of an archaeological textile. Others are, as it will become clear from the following chapters, of a more generic character.

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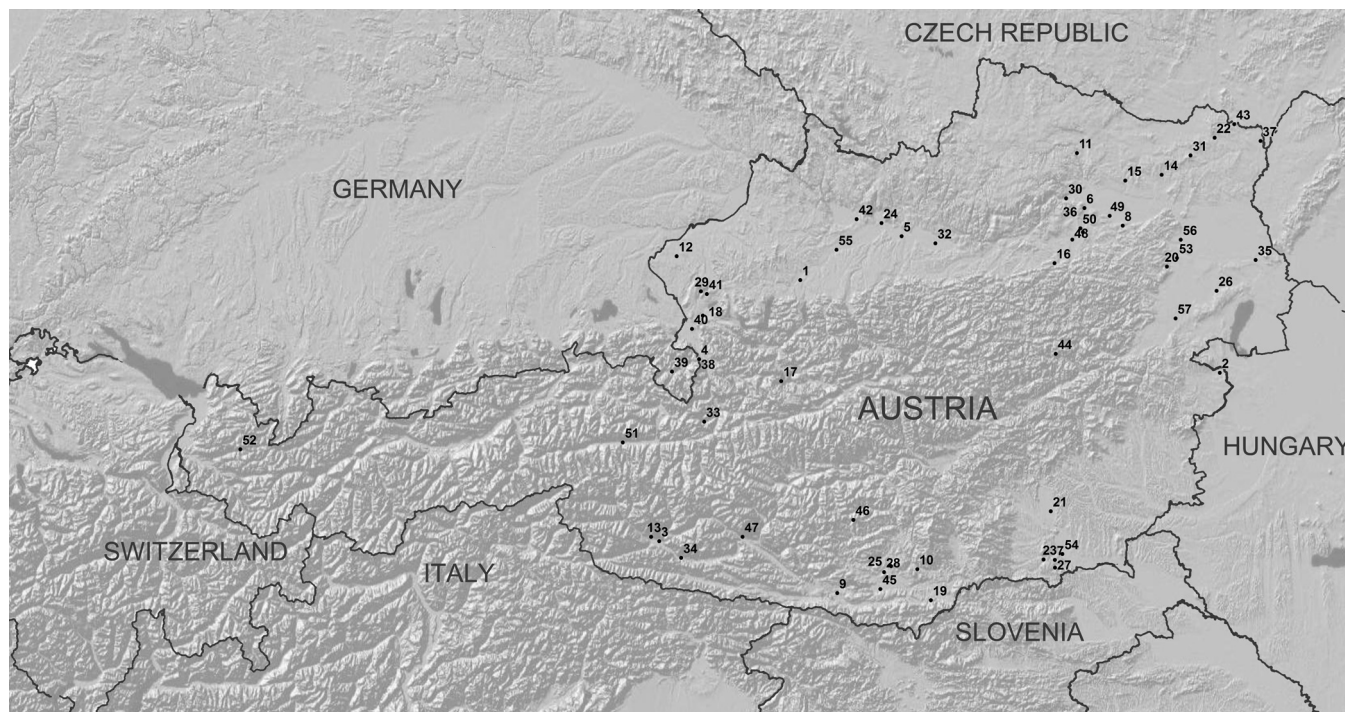
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Early Bronze Age (Bz A)	2200–1600 BC
Middle Bronze Age (Bz B-Bz C/D)	1600–1200 BC
Late Bronze Age (Ha A and Ha B)	1200–850/800 BC
Early Iron Age (Ha C and Ha D)	800–450 BC
Late Iron Age (Lt)	450–50 BC
Roman period	50 BC–AD 600

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Map 1.1. Austria. Sites mentioned in Chapters 1 and 2:

- | | | |
|---------------------|-----------------------|-------------------------|
| 1 Attergau | 20 Kalenderberg | 39 Ramsautal |
| 2 Deutschkreutz | 21 Kalsdorf | 40 Salzburg |
| 3 Dölsach | 22 Kleinhadersdorf | 41 Schleedorf-Mölkham |
| 4 Dürrenberg | 23 Kleinklein | 42 Schönering |
| 5 Enns-Lorch | 24 Linz-St.Peter | 43 Schrattenberg |
| 6 Franzhausen | 25 Magdalensberg | 44 Schusterwald Höch |
| 7 Frauenberg | 26 Mannersdorf | 45 Srejah |
| 8 Freundorf | 27 Mantern | 46 St. Agatha |
| 9 Frög | 28 Maria Saal | 47 St. Peter in Holz |
| 10 Führholz | 29 Mattsee | 48 St. Pölten |
| 11 Gars-Thunau | 30 Mautern | 49 Trasdorf |
| 12 Gilgenberg | 31 Michelstetten | 50 Unterradlberg |
| 13 Gravendorf | 32 Mitterkirchen | 51 Uttendorf im Pinzgau |
| 14 Grossmugl | 33 Mühlbach-Hochkönig | 52 Vorarlberg |
| 15 Grossweikersdorf | 34 Oberdrauburg | 53 Vösendorf |
| 16 Grünau | 35 Petronell | 54 Wagna |
| 17 Hallstatt | 36 Pottenbrunn | 55 Wels |
| 18 Hellbrunner Berg | 37 Rabensburg | 56 Wien (Vienna) |
| 19 Hemmaberg | 38 Ramsaukopf | 57 Zillingdorf |

Austria: Bronze and Iron Ages

Karina Grömer

Introduction

Textile finds are usually rare in Central European climatic conditions. The wet climate with substantial temperature variations between summer and winter destroys organic material in the soil. Occasionally, textiles are preserved in connection with metal objects in graves, and, in some cases, as imprints on pottery. Austria is unique in Europe in possessing two archaeological sites, where prehistoric textiles have been preserved by salt. The salt-mines of Hallstatt and Dürrenberg have produced the largest number of textiles found in Austria. Salt was a very valuable commodity in prehistoric times and the wealth accumulated through the salt trade by the populations of Hallstatt and Dürrenberg is evident in their graves and even in the textile finds. The textiles were embedded in the salt rock, whose bactericide properties and a constant anaerobic climate contributed to the excellent preservation of these fabrics, including their elasticity and colour. These special conditions in the mines preserve animal and plant material such as wool, leather, tree bast, linen and wood very well.

Chronological and Cultural Background

The earliest textiles hitherto retrieved in Austria date to the Early Bronze Age (Reinecke Bz A),¹ dated 2200 to 1600 BC. During this period, flat inhumation graves are common. Typical for the period is the co-existence of larger, supra-regional unities, such as the Aunjetitz (Unětice) culture in the region north of the Danube, and smaller cultural groups, such as the Straubing culture in south Germany and Upper Austria and the Unterwölbling group in Lower Austria. The smaller groups are distinguished from each other by differences in the shape and decoration of pottery. Sometimes, the distribution of artefacts belonging to these groups shows sharp and consistent geographical borders, which might indicate a tribal organisation of society. Metalwork has generally been much more widely distributed than pottery and does not conform to these borders. This metalwork may have been produced at specialised workshops catering to the elite of a large geographical area. Exchange and trade along rivers like the Danube provided connections between the regions, whereas the Alps usually acted as a barrier between archaeological cultures (*cf.*

Rast-Eicher in this volume). However, there are also passages through the mountains from north to south. Some fortified settlements and rich burials such as Franzhausen (Neugebauer 1996) indicate an increase in social stratification already in the Early Bronze Age. Another typical phenomenon of the Early and Middle Bronze Ages is the deposition of bronze objects in great hoards.

The Early Bronze Age is followed by the Middle Bronze Age Tumulus culture (Reinecke Bz B-Bz C, 1600–1250 BC). This period is characterised by multiple inhumations under large burial mounds (*tumuli*), at least, for the upper levels of society. This burial rite is seen as an influence from the Bronze Age Carpathian groups. It is interesting that, in this period, there is only sparse evidence of fortifications and hill forts. Trade contacts with the south-east continue and probably even expand. Large and uniform cultural complexes characterise the Middle Bronze Age, and changes in the material culture are taking place. The pottery and jewellery is elaborately decorated. In weaponry, the Early Bronze Age daggers are replaced by swords. It is in the Middle Bronze Age that salt-mining started in Austria, in Hallstatt (about 1500 BC).

The Late Bronze Age (Bz D; Reinecke Ha A and Ha B; 1250–850/800 BC) is generally connected to the Urnfield culture, defined by a common and widespread cremation burial practice. The Urnfield culture covers the phases Hallstatt A and B, not to be confused with the Hallstatt culture (Ha C and D) of the following Iron Age. The Urnfield culture spread over an area stretching from western Hungary to eastern France, and from the Alps to near the North Sea. New types of weapons, tools and pottery were introduced during this time. The settlement structure also changed and the number of settlements increased dramatically. Heavily fortified settlements, often situated on hilltops or in river bends, are typical for the Urnfield culture. These hill forts are interpreted as central places (Urban 2000, 196–199) and their emergence is considered a sign of increased warfare.

Hallstatt A and B (Ha A and B) correspond to the Late Bronze Age (c. 1200–800 BC) and are connected to the Urnfield culture (Urban 2000, 225–368), while Hallstatt C and D refer to the Hallstatt culture. Hallstatt C (Ha C) refers to the Early Iron Age (c. 800–600 BC)

and is characterised by the first appearance of iron swords. By the Late Hallstatt period (Ha D, 600–450 BC), iron daggers are found in graves.

The Hallstatt culture was named after the site of Hallstatt, a lakeside village in the Austrian Salzkammergut, where in 1846 Johann Georg Ramsauer discovered a large prehistoric cemetery. Excavations at the cemetery are still in progress and about 1500 burials have been uncovered to date (Kern 2005). The style and decoration of the grave goods found in the cemetery are very distinctive, and artefacts made in this style are widespread throughout Europe. The community at Hallstatt had exploited the salt mines in the area ever since the Middle Bronze Age, and it is here that a large proportion of the prehistoric textiles of Austria was found.

The Early Iron Age Hallstatt period can be divided into two large European cultural zones. The Eastern Hallstatt cultural zone (*Osthallstattkreis*) included Croatia, Slovenia, western Hungary, the eastern and southern parts of Austria, the Moravian region of the Czech Republic and Slovakia. The Western cultural zone (*Westhallstattkreis*) included Alto Adige (*Südtirol*) in northern Italy, Switzerland, eastern France, southern Germany and the Bohemian region of the Czech Republic (cf. relevant articles in this volume). The approximate dividing line between the two cultural zones runs from north to south through the Hallstatt site itself. The Western Hallstatt culture was generally richer and culturally more advanced than the Eastern Hallstatt zone. Trade with the Mediterranean areas resulting in the import of luxury goods is particularly evident in the Western Hallstatt cultural zone.

Hallstatt settlements were mostly fortified, situated on hilltops and surrounded by little villages. Rich tumulus graves of individuals from the higher strata of the society have been uncovered in the central Hallstatt regions. These graves often contain chariots and horse bits or yokes, as for example, the chariot burials at Mitterkirchen (Urban 2000, 275–278).

The Hallstatt period is followed in the Late Iron Age by the La Tène period, named after the archaeological site on the north side of Lake Neuchâtel in Switzerland. The La Tène culture developed and flourished from 450 BC to the Roman conquest in the 1st century BC in north-east Italy, France, Switzerland, Austria,

south-west Germany, the Czech Republic, Slovakia, Romania and Hungary (*cf.* relevant articles in this volume). The La Tène period is generally linked to the Celtic culture.

One of the most important Early La Tène sites in Austria is the salt-mining and trade centre of Dürrnberg. From the Late Hallstatt period, the extraction of salt was an important contributor to the flourishing economy of this site. The administrative centre, settlements and workshops were identified at the locality of Ramsaukopf (Irlinger 1995).

Initially, the La Tène people lived in open settlements that were dominated by the chieftains' towering hill fortifications. The development of towns, *oppida*, takes place in the Middle La Tène period. At the same time, the circulation of coins was introduced. In the later La Tène period (*c.* 200 BC) the Regnum Noricum was formed in Austria (Urban 2000, 358–370, 365). The *oppidum* of Magdalensberg became an important religious and trading centre during this period (*cf.* Gostenčnik in this volume).

The country is mountainous and rich in iron, and supplied material for the manufacturing of arms in the Roman province of Pannonia and northern Italy. The famous Noricum steel (*ferrum Noricum*) became an important trading product, especially when steel was introduced for the making of Roman weapons. At the end of the 1st century BC, the areas south of the Danube were added to the Roman Empire to constitute the principal part of the Roman province of Noricum (*cf.* Gostenčnik in this volume).

Research History

The first prehistoric textiles of Austria were found during salt-mining activities at Hallstatt. After the exploitation of mines in prehistoric times, mining activity was resumed after the Migration period and early medieval times and continues to this day, carried out by the *Salinen Austria* Company. Prehistoric mining debris such as torches and broken tools – called 'heathen rock' (*Heidengebirge*) – have been found in the mines early on. The most spectacular finds were the human bodies, as the one found at Hallstatt in AD 1734 (Barth 1989) or the mummified prehistoric bodies from the Dürrnberg salt-mine found in AD 1573 and 1616 (Klein 1961). According to the written

accounts of the finds, the bodies were well preserved and sometimes even clothed. The miners who discovered the bodies realised that these finds had to be very old, thus referring to them as 'heathens' (*Heiden*). Unfortunately, all these prehistoric mummies were subsequently buried and no longer survive.

From the middle of the 19th century onwards, members of the modern mining industry like Johann Georg Ramsauer at Hallstatt became interested in collecting the old finds. Recently, large excavation projects have been carried out in the Hallstatt salt mine by the Museum of Natural History in Vienna (Fritz-Eckart Barth and Hans Reschreiter; Reschreiter 2005) and in the Dürrnberg mines by the Deutsches Bergbau-Museum Bochum and Ruhr-Universität Bochum (Thomas Stöllner). Thanks to these excavations, the number of textile finds from salt mines has increased rapidly.

The pioneer of research on the salt-mine textiles was Hans-Jürgen Hundt, who examined the textiles found before 1984. He published several short articles with textile catalogues comprising technical data such as weave structure, thread count, yarn diameter, as well as detailed descriptions of patterns, seams and hems (Hundt 1959; 1967; 1987). His work was continued by Katharina von Kurzynski, who worked on Iron Age textiles from the salt mines and published a catalogue of the textile corpus from Dürrnberg (von Kurzynski 2002), as well as a summary of Iron Age textiles in Austria (von Kurzynski 1996). The present author's doctoral dissertation dealt with the Bronze and Early Iron Age textiles from the Hallstatt salt mine (Grömer 2007a).

Dyestuff analyses were carried out recently on the Hallstatt material (Hofmann-de Keijzer *et al.* 2005) and on the Dürrnberg textiles (Stöllner 2005, Fig. 11). Specialised fibre analysis such as wool measurements were performed by Irene Skals (2007) for the Bronze Age Hallstatt material and by Michael Ryder (2001) for the Iron Age Hallstatt and Dürrnberg finds. Helga Mautendorfer (2005) studied the sewing techniques of the Hallstatt salt-mine textiles.

Hans-Jürgen Hundt also analysed many of the Austrian grave finds and published a catalogue of textiles from the Dürrnberg grave finds (1974), as well as other Iron Age grave finds from Austria. Lise Bender Jørgensen (1992;

2005) recorded Iron Age grave textiles from Uttendorf, Dürrenberg, Mitterkirchen, Mattsee, Hallstatt, Schrattenberg and Schusterwald. Recently, smaller grave textile finds were published for Mannersdorf (Müllauer and Rams 2007), Führholz (Grollegger 1997), Pottenbrunn (von Kurzynski 2002) and Berg/Attergau (Grömer 2007c).

Bronze Age

Five Bronze Age locations in Austria have yielded woven fabrics, namely the grave finds from Vösendorf and Franzhausen with several fragments, settlement finds from Trasdorf, the copper mine Mitterberg/Hochkönig with six fragments and the Bronze Age salt-mines at Hallstatt with 58 textile complexes² consisting in all of about 111 single pieces.

Textiles at the Early Bronze Age graveyard of Franzhausen were preserved in contact with bronze artefacts (Grömer 2007a, 140). Some of the pieces are simple coarse tabbies with a 1 mm thick Z-plied yarn and 5 threads/cm. Grave 110 of a young woman is especially noteworthy: the rich grave goods and jewellery, as well as the textiles, are examples of extraordinarily fine workmanship. The textile from the woman's headdress is a very fine ribbed linen tabby (17/7 threads/cm) made of fine S-plied yarn 0.4 mm thick. An interesting aspect of this find is that it has been woven

with stripes (Fig. 1.1). There are groups of six dark brown threads and a small olive-green stripe (eight threads) with a large one (36 threads) between them.

In Trasdorf near Tulln, some pits dated to the Middle Bronze Age (Reinecke Bz B2), were found in a settlement. One of the pits contained seven clay plates with textile impressions. All of them are simple tabbies, with yarn diameters of 1–1.5 mm and a thread count of about 4 threads/cm (Neugebauer 1970, 24–25, Figs 18–20).

The copper mine of Mühlbach/Hochkönig-Mitterberg is dated to 1600–1500 BC. The textiles (Fig. 1.2) found at the copper-mining area are made of single wool yarns with coarse 1–1.5 mm thick z- and s-twisted threads and a thread count of 5–6 threads/cm (Grömer 2007a, 141). One of these coarse textiles has a simple starting border. The most important piece from this site is a wool rep band (warp-faced) made with plied yarn (Fig. 1.2). The band is very finely made, with 0.3–0.4 mm yarn and 29/7 threads/cm. The special effect of the band is produced by the alternation of groups of s- and z-twisted plied yarns in the warp; the change is irregular. This is the earliest find of a spin-patterned textile in Central Europe.

Textile fragments corroded on a bracelet (Fig. 1.3 left) were found in an urn grave from Vösendorf (Reinecke Ha A) (Grömer and Mehofer 2006). This find is important because

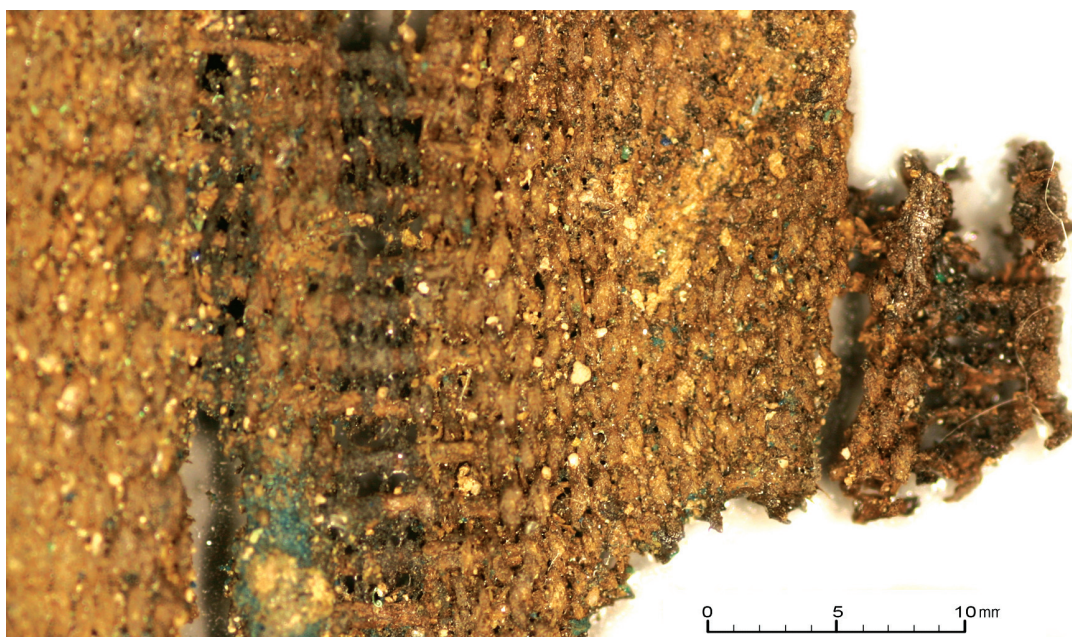


Fig. 1.1. Early Bronze Age linen textile with stripes from Franzhausen (Photo: K. Grömer).

of the use of basket weave, and fine, single s-twisted yarn with a diameter of 0.2–0.3 mm (the fibre of which could not be identified). Other urn graves from the same site yielded fine gold threads (Fig. 1.3 right) which may have been part of a textile. Unfortunately, these graves were excavated during the Second World War and no further information is available.

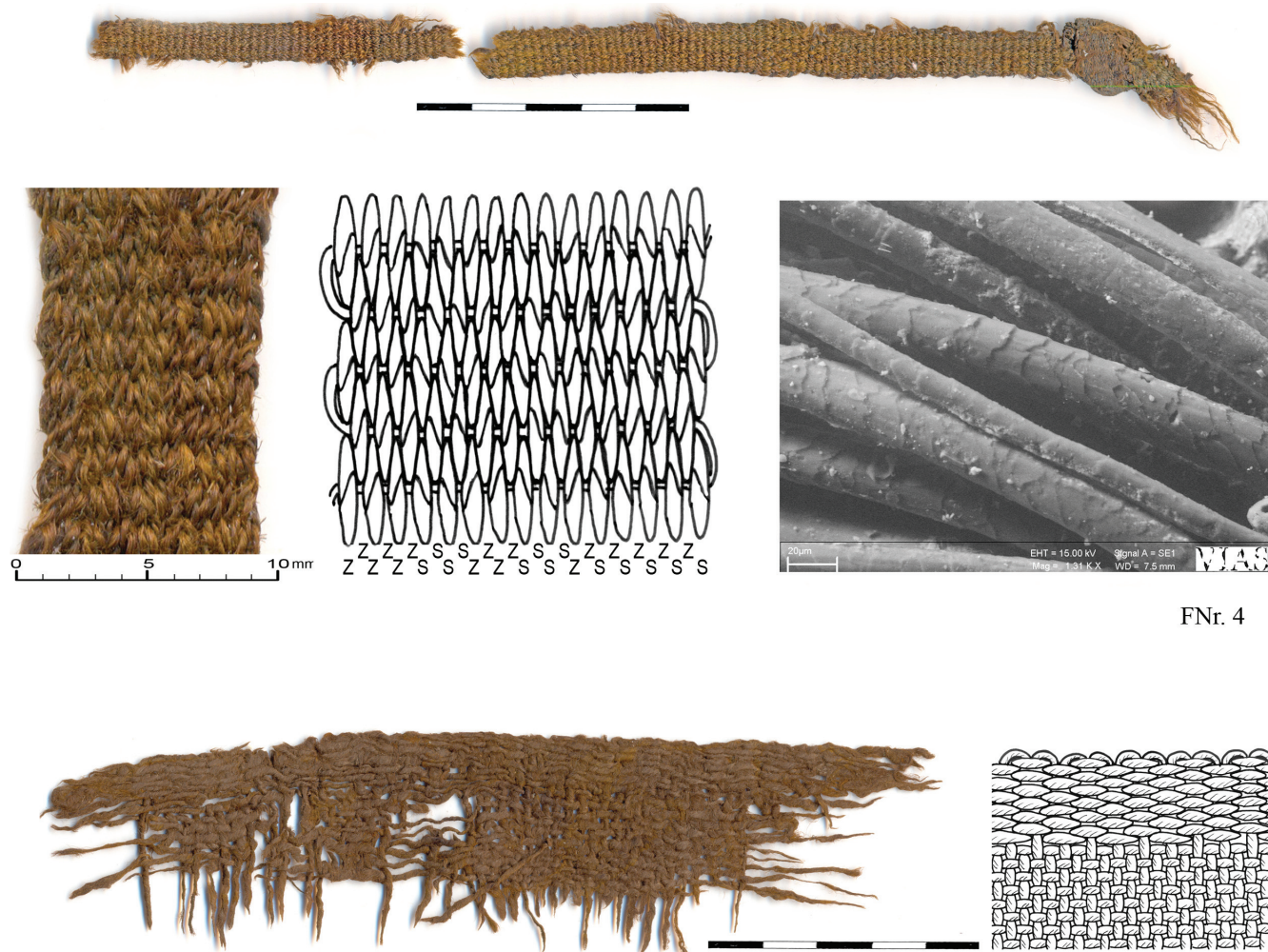
Bronze Age Salt Mines of Hallstatt

In Hallstatt, deep shafts were dug into the mountain to mine deposits of rock salt in prehistoric times. The salt mine is divided into different parts, and mining began in the Middle Bronze Age, c. 1500 BC, in the area now called 'Nordgruppe'. Textiles are known from the find spots of Grünerwerk and Appoldwerk. Around 1460–1245 BC, mining activities are attested in the Christian-von-Tuschwerk, where the oldest

wooden stairs were also found (Reschreiter and Barth 2005). Most of the Bronze Age textiles were collected from this area.

Surprisingly, most of the 111 pieces are made of wool, while only two pieces are made of linen. While no plied yarns were used for weaving at Hallstatt during the Bronze Age, they were used as sewing thread or for the reinforcement of starting borders. The yarns, typical for the Bronze Age, usually have a yarn diameter of around 0.6–1.2 mm, with more than 60 % of the material consisting of very coarse yarn with a diameter of 1.2–2.5 mm. However, very fine qualities are found too, with 0.3 mm thick wool threads. The thread counts of the fabrics fit very well into this picture. Textiles with 4–6 threads/cm are common, while thread counts of 6–10 threads/cm are not as frequent. There are only few fine textiles, such as a rep band with 24 threads for the warp

Fig. 1.2. Textiles from a copper mine at Mühlbach/Hochkönig-Mitterberg: spin-patterned rep band and coarse textile with a starting border (Photos © K. Grömer and VLAS Vienna).



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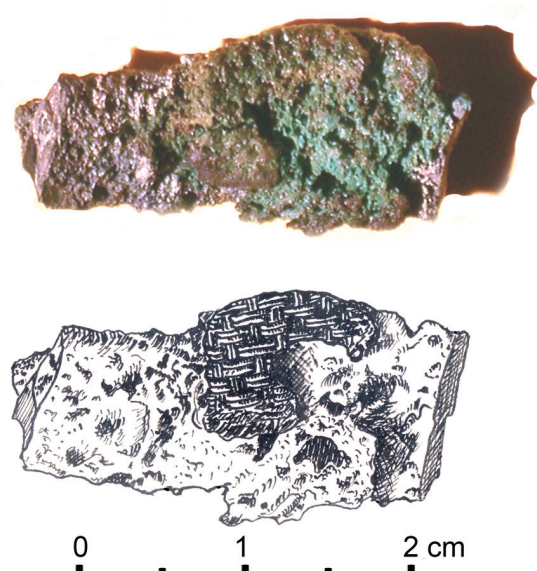


Fig. 1.3. Bracelet with basket weave (left) and golden threads (right) from Vösendorf (© Museum der Stadt Wien).

and 14 threads for the weft and a fine twill with 18/20 threads/cm.

The main weave type is tabby (Fig. 1.4). There are various combinations of s- and z-twisted yarn; in the earlier Grünerwerk, a preference for s-twisted yarn is noted, while at Tuschwerk more z-twisted yarns are observed. The groups of tabbies from Bronze Age Hallstatt (s/s, z/z, s/z) are not completely uniform. Within these groups, there are many variations of different thread counts, yarn diameters, density and surface treatment. Another visual effect is present in two pieces, which show the alternation of 1–2 s- and z-twisted single yarns in one thread system (Fig. 1.5). This is an ancestor of the spin patterns, which became well known during the Iron Age.

There are some textiles with thin threads and a low thread count, *i.e.* open weaves. On the other hand, there are also very thick, dense and strong fabrics. This variety allowed a visual grouping of the Bronze Age tabbies (see Hammarlund 2005; *cf.* Mannering *et al.* this volume) into separate groups, such as ‘open tabbies’ (*lockere Leinwandbindung*) or ‘thick tabbies’ (*verdichtete Leinwandbindung*). The latter have coarse threads, a high cover factor, sometimes a felted surface and may be construed as carrying or hauling bags for use in the salt mines.

Rep is also known in Hallstatt, used both in starting borders and ordinary weaving. One

very coarse wool rep band has 1 mm thick warp yarn and a weft which consists of 3–4 mm thick yarn combined with a thinner and stronger yarn. Both selvages are preserved, so the width of the band can be estimated at 17 cm.

The twill variants from Bronze Age Hallstatt are very important finds for this period and region as they are among the earliest twills known (Fig. 1.4 bottom). Two of them, found at Grünerwerk, are made of flax. Hans-Jürgen Hundt (1960, Taf. 14/2 and 15) originally published these two fragments as 2/2 diagonal twills, while the bast fibre could not be specified at that time (flax or hemp). New investigations have determined that the material is flax and the binding is a 2/1 twill. The weaves are made of 0.6–1 mm single z-twisted yarn; the warp has 12 threads/cm, and the weft only 7 threads/cm. A new exciting find is a small piece of 2/2 herringbone twill from Tuschwerk, made with paired yarns in warp and weft. It is very fine with 0.2–0.3 mm yarns and a thread count of 18/20 threads/cm (9/10 double yarns/cm).

Dyed textiles are rare finds in Bronze Age Europe. Eight fabrics from Hallstatt-Tuschwerk and Grünerwerk have until now been analysed (Hofmann-de Keijzer *et al.* 2005 and 2007), four of which yielded evidence of dyeing. More than five dyestuff components were identified in one dark textile, including indigotin for blue and luteolin and apigenin for yellow. Moreover, woad and weld may have also been used in the dyeing process. A red dye from

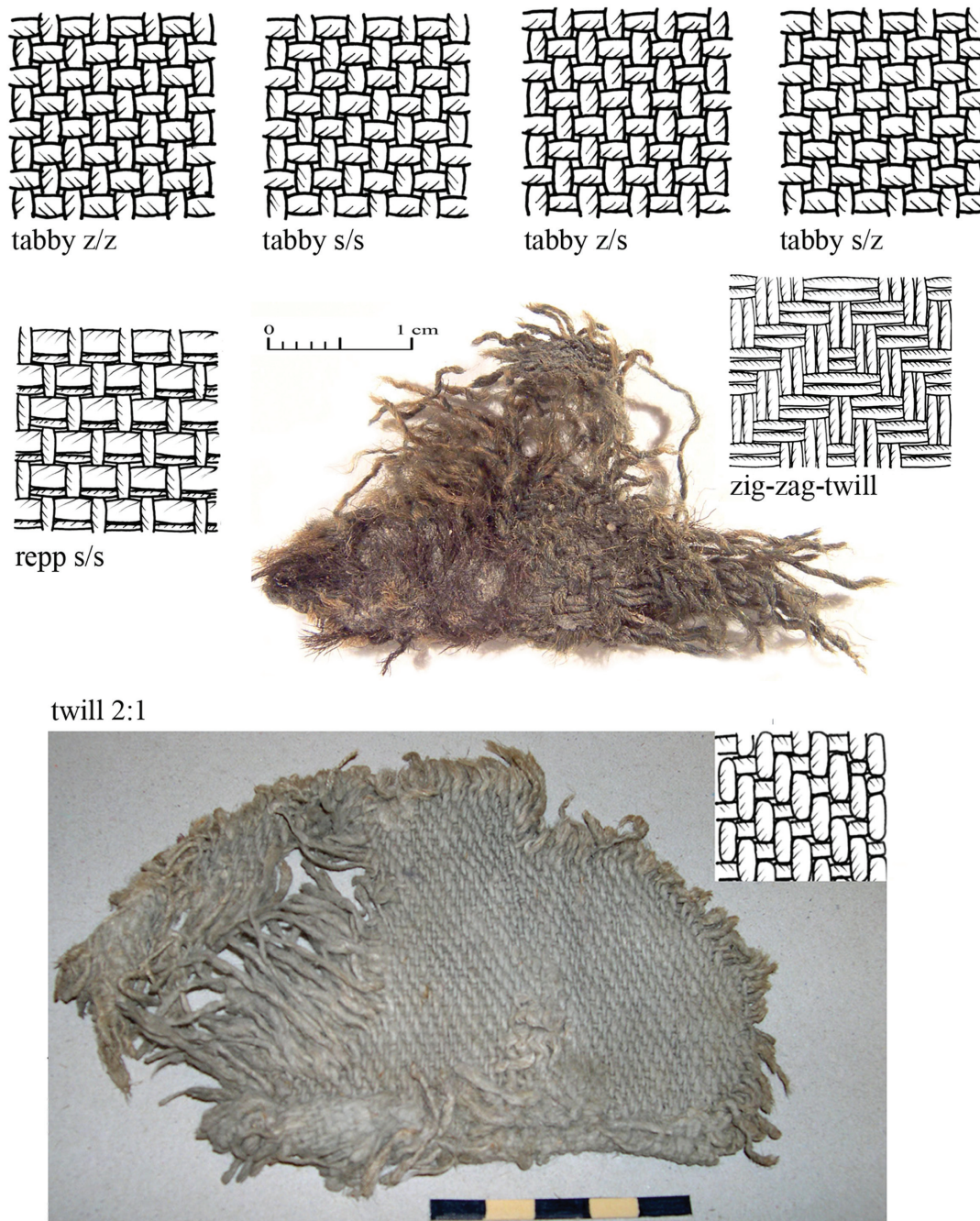


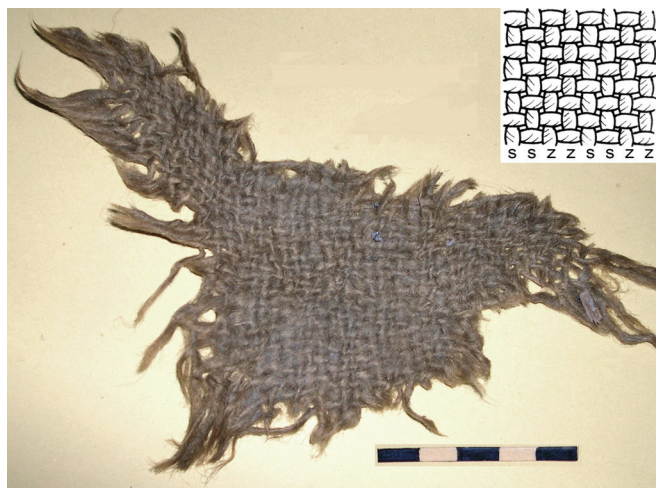
Fig. 1.4. Bronze Age weave types from Hallstatt (© Museum of Natural History Vienna; Graphics: K. Grömer).

another sample may possibly be wild madder. These textiles were likely piece-dyed, because in the areas where the structure of the fabric has disintegrated, it is evident that the colour had not fully penetrated it.

The texture of the textile surface has sometimes been changed by fulling to make it wind- and waterproof. The same process is used today to produce the well-known *Lodenmantel*, which is part of the national

costume of the Salzkammergut region, where Hallstatt is situated.

Among the 58 textile complexes of Bronze Age Hallstatt are many preserved edges. The various types can be seen in Figure 1.6. There are numerous simple selvages and starting borders; some borders are reinforced with threads and cords. The threading of the starting border in Hallstatt Textile 217 is particularly interesting (see Fig. 1.6g): two single s-twisted



Tuschwerk Gewebe 02-065



Tuschwerk Gewebe 94.114a



Fig. 1.5. Spin-patterned textiles from Hallstatt
(© Museum of Natural History Vienna;
Graphics: K. Grömer).

weft yarns alternate with two single z-twisted yarns, producing a ribbed pattern with a single s-twisted warp yarn, forming a firm heading band. In the ground weave, the doubled yarns are separated and crossed so that one s-twisted yarn is next to one z-twisted yarn in warp and the weaving continues in tabby. The weft here is a single s-twisted yarn.

Three fabrics with plaited borders have been found at Hallstatt-Tuschwerk. Plaited borders are usually not common in Central Europe, but they are known in Bronze Age Scandinavia (Sundström 2010; cf. Franzen *et al.*, Mannering *et al.* this volume), where they are usually made in fabrics woven on a loom with a tubular warp. It is possible that one of the plaited borders from Hallstatt is a finishing border (Hallstatt Textile 231, Fig. 1.6h). However, in another case (Hallstatt Textile 236), both ends of the plaited border continue into the tabby ground

weave (Fig. 1.6i), indicating that this might be a starting border.

The same piece shows interesting traces of repair (Fig. 1.7). The border was repaired twice: first, with a fine yellow yarn, and later with a dark thick yarn. Another noteworthy aspect of this textile is the presence of gores. The first gore is situated only a few centimetres after the starting border and the second only after another 6 cm of weaving. The gores were probably made to widen the weave rather than to correct a mistake. Weft gores have been noted in the textiles from Bronze Age Scandinavia, where they were often used to correct an uneven weft line (cf. Mannering *et al.* this volume).

The Bronze Age mines of Hallstatt yielded many textiles with various stitches, seams and hems. There are even some pieces where the woven cloth was cut, sometimes folded and

Fig. 1.6. Different types of Bronze Age borders from Hallstatt
(© Museum of Natural History Vienna; Graphics: K. Grömer).

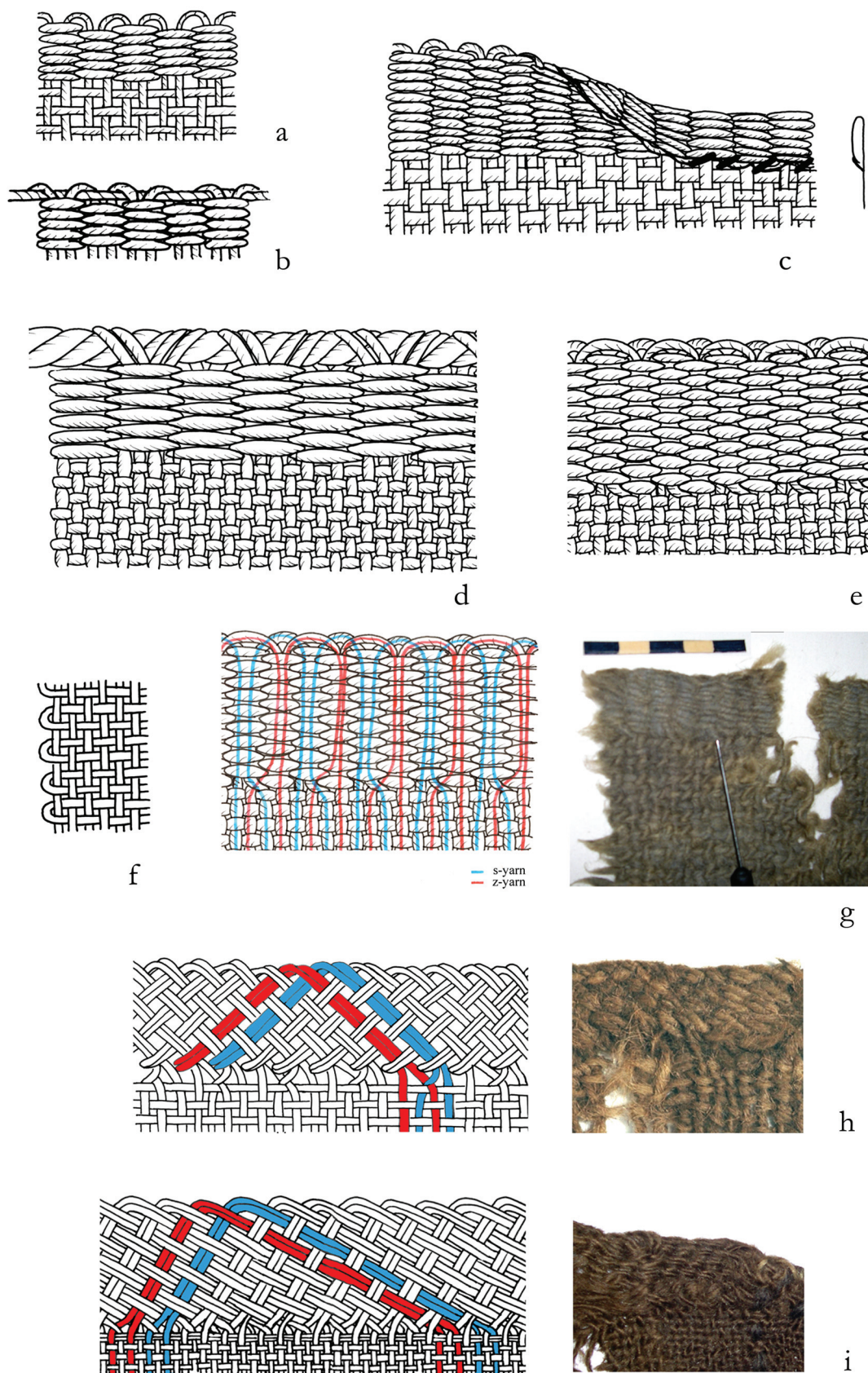
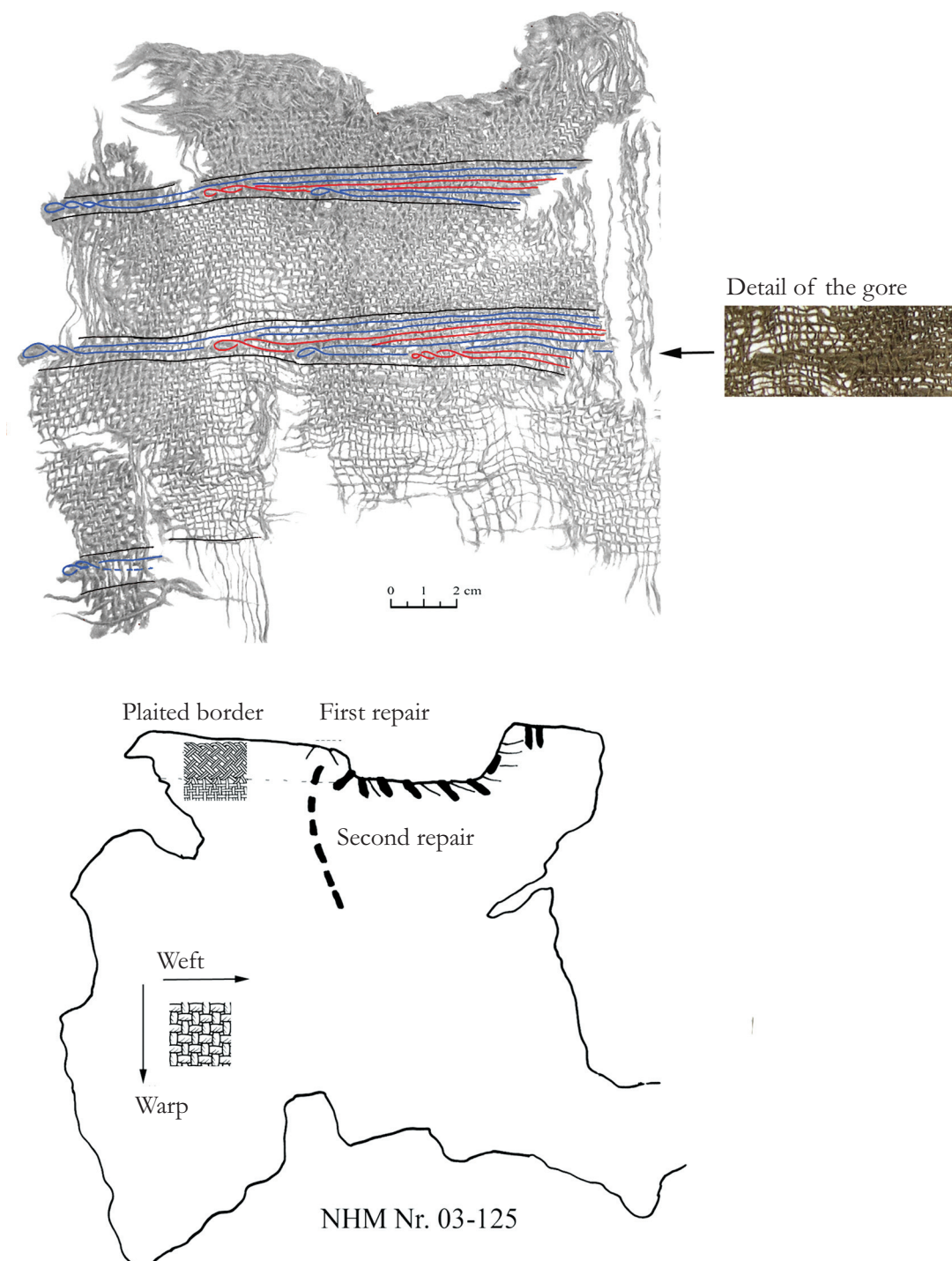


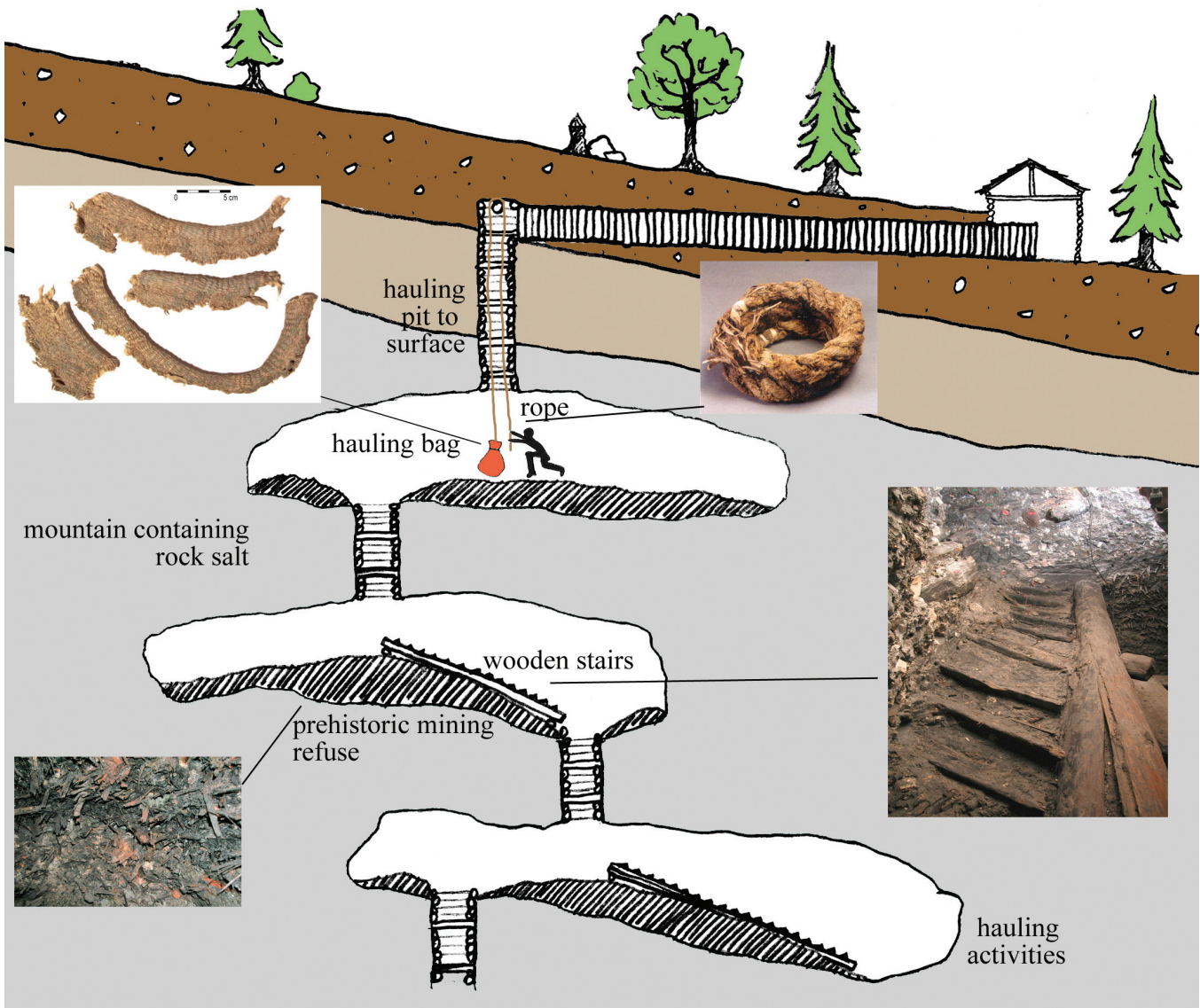
Fig. 1.7. Bronze Age textile with gores and marks of repair from Hallstatt (© Museum of Natural History Vienna; Graphics: K. Grömer).



finished with a hem. Similar to textiles from Bronze Age Scandinavia (*cf.* Mannering *et al.* in this volume), hems are overcast with buttonhole stitches. Some of the seams and hems are primary while other sewing was for repairs due to wear and tear.

Chronological and Regional Textile Developments in Bronze Age Austria

Early Bronze Age textiles are very simple, the dominant weave type is tabby, often in a ribbed variety (*e.g.* Franzhausen), and sometimes rep. Rep is also used for starting borders. An interesting aspect of the Early Bronze Age



textiles is that already at this early date they show patterns and decorative elements, some of which are based on Neolithic traditions (Barber 1991, 133–144; Rast-Eicher 2005, 124–129). For example, a striped textile with the now visible olive-green and dark-brown colours is known from Franzhausen (Grömer 2007a, 140).

Plain tabby, sometimes in its ribbed variant is also the most common weave during the Middle Bronze Age. There are also very open weaves (*Schleiergewebe*), for example, from Hallstatt. Here, plaited borders are found, which are similar to contemporaneous Scandinavian finds (cf. Franzén *et al.* in this volume). The Middle Bronze Age saw the appearance of twill textiles. The Bronze Age twills not only include the

simpler types such as 2/1 or 2/2 twills, but also more complicated twills such as chevron twill, as those found in Hallstatt.

In the Early Bronze Age, there are fine linen weaves in plied yarns. With the transition from the Early to Middle Bronze Age around 1600 BC, wool yarn dominates in Hallstatt, where only 2 out of 58 textile complexes (111 single pieces) are made of linen (z-twisted single yarn). Likewise, coarse yarns of 1–1.5 mm diameter and thread counts of 5 threads/cm dominate, but very fine qualities occur as well. There is a variation of s- and z-twisted yarns, although, unlike in other areas (cf. Bazzanella in this volume), plied yarn has not been found, except in sewing thread. In the Middle Bronze Age, wool fabrics usually have coarser threads

Fig. 1.8. Archaeological evidence of a 'filling station' for hauling salt at the Tuschwerk mine, Hallstatt (© Museum of Natural History Vienna; Graphics: K. Löcker and K. Grömer).



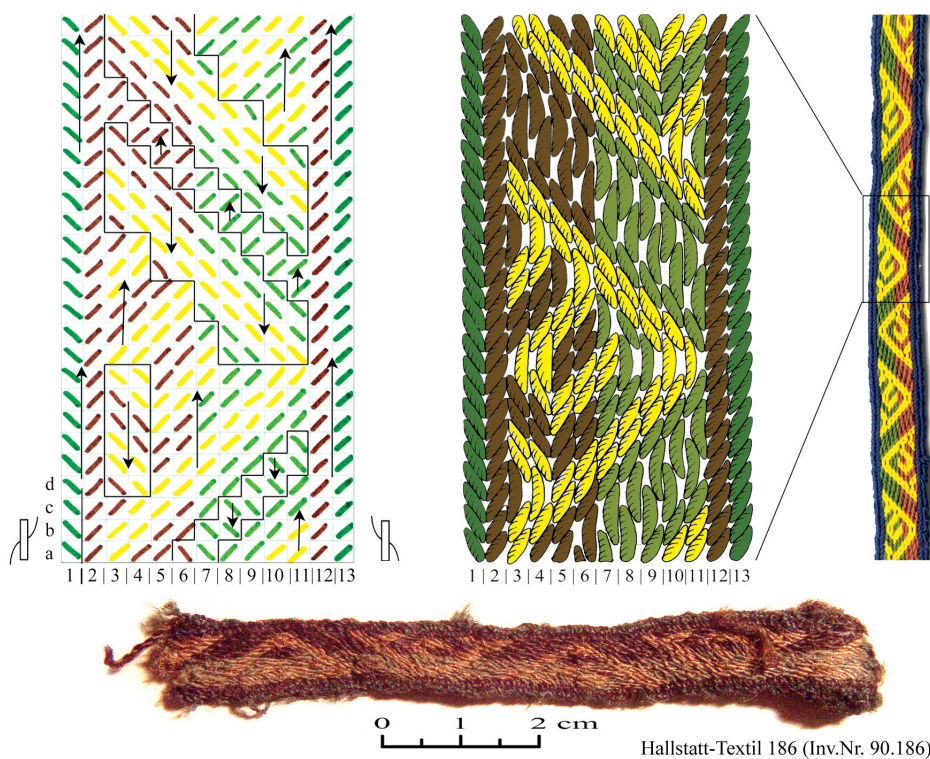
Fig. 1.9. Hallstatt salt-mine, Eastern group, Early Iron Age. Different textile structures, colours and patterns (© Museum of Natural History Vienna).

than the linen ones. At Hallstatt we find the first fine wool yarns. The tendency to have finer fabrics in wool appears in the Urnfield Culture and becomes characteristic for the Hallstatt period.

The earliest spin pattern comes from Mitterberg (during the transition of the Early/Middle Bronze Age), and such patterns

increase in the Middle Bronze Age. Usually, spin patterns are made in wool yarn and consist of alternating s- and z-twisted yarn in one thread system. The pattern is known in Central Europe from Hallstatt, but also from Scandinavia (Ehlers 1998, 99 and 124; Mannering *et al.* this volume). The use of colour for patterning and dyeing becomes more common. Dyes

Fig. 1.10. Iron Age tablet-woven borders from Hallstatt; analysis of the patterns (© K. Grömer, Photo: Museum of Natural History Vienna).



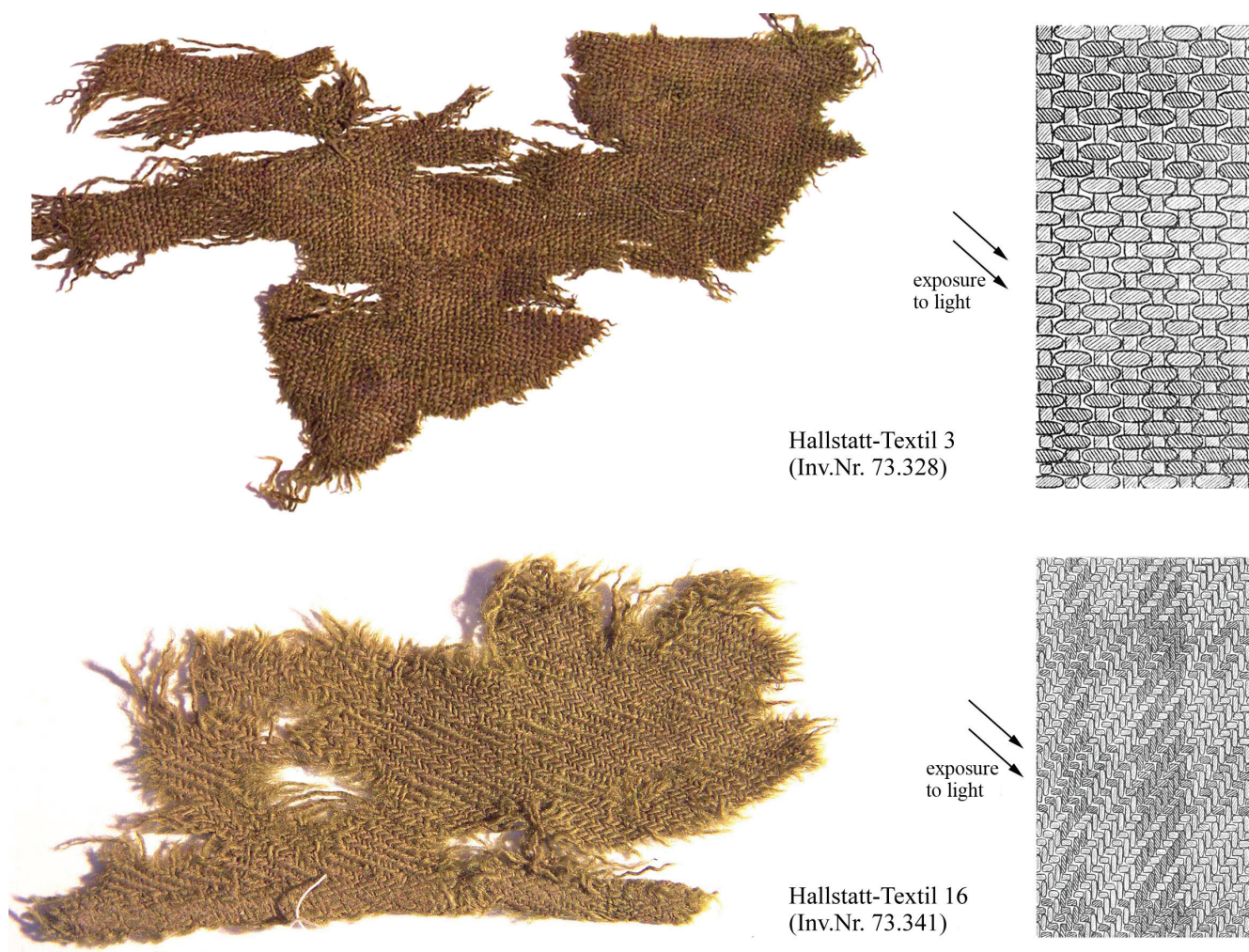


Fig. 1.11. Iron Age textiles with spin patterning in one and two directions from Hallstatt (© Museum of Natural History Vienna).

such as woad, weld and wild madder have been identified in Hallstatt salt-mine textiles (Hofmann-de Keijzer *et al.* 2005; 2007).

By the Late Bronze Age, the importance of twill increases and basket weave makes its appearance in the find from Vösendorf (Grömer and Mehofer 2006). In Central Europe, both flax and wool are used now, the latter more in the eastern part. The wool fabrics are made of single yarn, and the threads are finer. The use of S-ply yarn in both systems can be seen as a forerunner of the preferred weave types of the Iron Age Western Hallstatt culture, which covers the same area.

Textile Function

There is extensive archaeological evidence for the function of Bronze Age textiles found in Austria and Central Europe. Some textiles from graves seem to be parts of clothing; others have been used for the wrapping of

grave goods, as during the Iron Age (Bank-Burgess 1999 and this volume; *cf.* Gleba in this volume). The textiles found in the Bronze and Iron Age Hallstatt salt mines had many different purposes. Some of the finer fabrics could have been parts of clothing, but no complete garments were found in the prehistoric salt mines. The textiles are mostly very fragmentary and many pieces were found torn into strips. Most of the textiles were brought into the mine as rags and used as makeshift bindings or straps, carrier slings, handle reinforcements, tool repair material, wipes or even sanitary items. It is possible that one piece was a bandage for a wounded arm or leg. It is a coarse piece of wool tabby, torn or cut into a very flexible diagonal strip (5 × 19 cm), with thick cords stitched along its edges (Hundt 1967, Tab. 4/1).

The archaeological evidence indicates the presence of a 'filling station' at Tuschwerk (Fig. 1.8), where the rock salt was laboriously broken



Ferro-Schachtricht

Nr. 2190



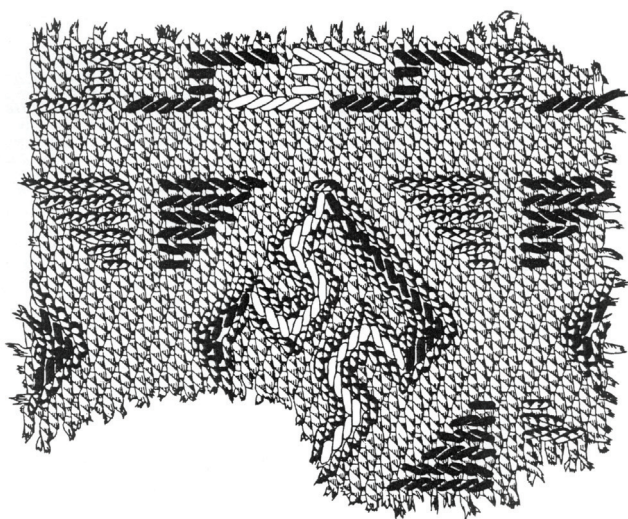
Nr. 1742-1



Nr. 818

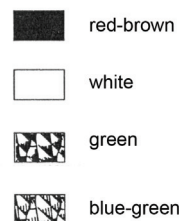
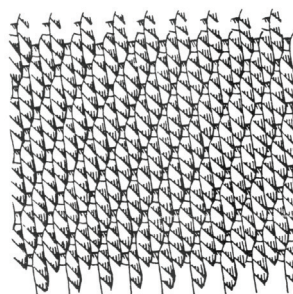


Georgenberg, o.Nr



Ferro-Schachtricht Nr. 2557

weave: 2/1 twill



up with picks and brought to the passage going up to surface. At this point, the salt was filled into the hauling bags and carried out from the mountain. Based on the technological evidence and the circumstances of discovery, some of the Bronze Age wool textiles can be interpreted as such hauling bags. These textiles are woven in tabby of very thick threads 1.5–2 mm in diameter, with a density of 5/5 threads/cm. The preserved pieces have very strong trimmings or edges and rep starting borders. Some pieces are additionally reinforced with seams, hems or cords. The surface of the fragments often appears heavily fullled, which was probably done in order to strengthen the fabric. These hauling bags from Tuschwerk are not uniformly made, many variants of s- and z-twisted yarns or types of edges are evident. It may be surmised that they were manufactured by different producers, rather than produced in a centralised workshop.

Textile Production

Archaeological evidence for textile production in Bronze Age Austria is present in Gars-Thunau (Schierer 1987), where spindle whorls

and loom weights were found in the settlement. Spindle whorls made from fired clay appear in great number in Central Europe especially in the Late Bronze Age. They are small, light, often elaborately decorated, and have a completely different appearance from the heavier Neolithic ones (Grömer 2006). The different weights of the whorls have a direct connection with different yarn diameters and fibres: lighter and more compact whorls indicate the production of finer (wool) yarns, which become more common during the Late Bronze Age and ubiquitous in the Early Iron Age. Evidence of the warp-weighted loom includes finds of starting borders on textiles as well as significant quantities of loom weights found in settlements like Großmugl “Todtenweg”, Großweikersdorf and Kleinhadersdorf (Gleser 2007).

Bronze Age textile production was generally carried out at a household level. The site of Hallstatt is exceptional, due to, on the one hand, the highly specialised work of the inhabitants in the Salzberg valley (salt-mining) and, on the other hand, the lack of raw materials for textile production (there being insufficient room

Fig. 1.12. Dürrnberg salt-mine textiles. Above: examples of stripes and checks (© Deutsches Bergbau-Museum Bochum); below: textile with floating thread (Fliegender Faden) pattern (After von Kurzyński 1998).

for flax fields or extensive sheep husbandry in the area). Most items are thought to have been acquired by the population of Hallstatt through trade or exchange. Much of the evidence indicates that some food, substantial quantities of wood and other raw materials, as well as some tools for salt mining were not produced in the Salzberg valley itself, but were brought there from about 40 km away (Barth and Grabner 2003, 85). Hauling bags in particular are thought to have been imported, rather than locally made in Hallstatt.

Iron Age

As in the case of the Bronze Age, Iron Age textile research in Austria is primarily connected to finds from the salt mines. As of 2007, they include 455 single fragments (from 203 textile complexes) found in Hallstatt, and more than 600 complexes of textiles from the Dürrnberg salt mine dated mainly to the Early La Tène period (late 6th–3rd centuries BC). Both sites were important economic centres in their time and are associated with the mining industry, which was already highly developed in the Bronze Age.

Furthermore, several Austrian cemeteries from the Hallstatt period have yielded mineralised textile remains (Table 1.1). Early Hallstatt period (Ha C) grave finds were excavated at Mitterkirchen, Uttendorf im Pinzgau, Führholz and Hallstatt itself, while the textiles from Gilgenberg, Mattsee, Schleedorf-Mölkham, Schusterwald, Berg/Attergau and some of the Hallstatt and Dürrnberg cemeteries date to the Late Hallstatt Period (Ha D). The La Tène Period (Lt A and B) graves from Dürrnberg, Schrattenberg, Pottenbrunn and Mannersdorf also contained textile fragments. In some cases, they not only survive on the surface of the metal objects but also as their inner filling (*e.g.* in hollow rings).

Compared to salt mines and cemeteries, woven fabrics are rare finds on settlements in Austria. A single find is known from Kalenderberg near Mödling, consisting of a twill imprint on a small discoid piece of clay (Franz 1923, 42). The site dates to the Hallstatt period and gave its name to a regional group in the Eastern Hallstatt culture, the Kalenderberg culture. Nevertheless, settlements are a good source of information on textile production, as tools made of clay, bone or metal, such as

spindle whorls, loom weights, needles or shears are common finds there (of course, they also appear in graves).

Hallstatt Period

Woven fabrics from the Early Iron Age are very heterogeneous, and attest to a wide range of different weave types and use of various patterns during this period. The main group of textiles dated to the Hallstatt period derives from the salt mine of Hallstatt, with some grave finds providing additional information.

The Hallstatt Salt Mines

A large representative group of Hallstatt period material consists of the textiles from the salt mines of Hallstatt (Grömer 2005a and 2007a with further references). The Hallstatt period textile finds, more than 350 single pieces (142 textile complexes), come from the ‘Ostgruppe’ (Hundt 1987; von Kurzynski 1996; summary with references in Grömer 2005a), which is contemporary with the Hallstatt cemetery. An additional 104 textiles from Kilbwerk are likely to be dated to the Hallstatt period. The salt-mine textiles were found dumped in the mines where prehistoric mining work had taken place for hundreds of years. Unfortunately, no detailed chronology is available at present for the Hallstatt textiles found in the Iron Age contexts (*cf.* Grabner *et al.* 2006 for Bronze Age mines).

All textiles from the Early Iron Age Hallstatt ‘Eastern Group’ (*Ostgruppe*) salt mine are made of wool. Linen is sometimes used in sewing thread, probably because flax fibre has a greater tensile strength than wool. As the preservation conditions in the salt do not destroy bast fibres, the predominance of wool must be explained by other factors, as in the case of Bronze Age material. Horse-tail hair was used as weft for some narrow bands. Thus, one tablet-woven band (1.3 cm wide) and two rep bands (one is a girdle 4.2 cm wide) were made with wool warp and horsehair weft.

Single yarns are preferred (with various combinations of s- and z-twist) for producing textiles. Plied yarn is not so common and appears only as warp combined with single yarn weft. The yarns generally have very fine diameters, most of them less than 0.5 mm and many about 0.2–0.3 mm in diameter. Coarser fabrics with yarn over 1 mm thick have been found, too, but they are rare.

The fine textile qualities defined by the yarn diameters are also evident in the thread counts. Nearly half of the textiles have 10–15 threads/cm. Even finer fabrics are known, with up to 40 threads/cm. These fabrics have yarns with a diameter of 0.1–0.2 mm and the finest of them are woven in basket weave. The coarser fabric types with low thread counts and coarse yarn are rare and are generally made in tabby and 2/2 twill.

The most common weave is the 2/2 twill (Fig. 1.9), which can be coarse or fine. Twill variants such as chevron, herringbone or lozenge twill demonstrate the exquisite technique of the Hallstatt weavers. Simple weaves such as tabby and its variants rep, basket and half-basket weave are less common. Broader bands with a width of 4.5–8.6 cm have been made in tabby, rep or even twill. One of these bands was patterned with floating warp threads (*fliegende Faden*): the rep ground weave is almost black, while the floating threads are red. The movement of these threads over and under the ground weave creates a checked pattern, where each square consists of three red stripes. Occasionally, narrow rep bands (approximately 1–1.5 cm wide) woven in either single or several colours also occur.

Finds of colourful tablet-woven borders or bands are also common among the textiles from the Hallstatt mines (Fig. 1.10). For tablet weaving, only four-hole tablets were used (for a detailed analysis, see Grömer 2005b). Sometimes, single wool yarn was used, but, most often, fine plied yarn dyed in different colours was used for the warp. Various patterns are preserved, simple stripes as well as triangles, diamonds and meanders. Similar motifs and combinations of the patterns can also be found on contemporary pottery (compare Schappelwein 1999).

Large textiles were patterned as well, and, sometimes, patterns were combined with intricate weaves (see Fig. 1.9). Colour patterns such as stripes and checks are characteristic for this area. Examples include finds of yellow and brown block checks in twill weave, as well as an olive-green chevron twill with composite dark brown checks. For the dogtooth pattern, a regular sequence of colours in warp and weft (groups of 4–6 threads) is woven in 2/2 twill. Not only the fine textiles but also the coarser ones were decorated, as in the case of a coarse olive-green tabby with irregular dark stripes.

Spin-patterning is very common among the textiles from Hallstatt (Fig. 1.11). They are made by alternating groups of single s- and z-twisted yarn and are known as a characteristic weave type (Vače type) for this cultural period in Central Europe (Bender Jørgensen 1992, 1122–1125, Figs 1 and 2). In Hallstatt textiles, the alternation of 6–8 s-twisted and 6–8 z-twisted yarns is typical. Spin patterns were made in tabby and basket weave, as well as in twill. Sometimes, even complicated herringbone twills have spin patterns. Usually, spin-patterning is used in one thread system, so that shadow stripes are created. Shadow checks can be produced with spin patterning in warp and weft. More than 75% of all textiles from the Early Iron Age Hallstatt salt-mines are patterned by spin variation, colour or the use of complex twill weaves.

The dyestuff analysis of textiles from Hallstatt showed that the dyeing of textiles was much more common during the Hallstatt period than previously thought, and that complex dyeing techniques were in use (Hofmann-de Keijzer *et al.* 2005). A total of 25 different dye constituents, including indigotin and indirubin, luteolin and apigenin, quercetin, ellagic acid, as well as red dyestuffs originating from insects and presumably from lichens were identified. In the green, black and blue textiles, combinations of dyestuffs were detected, suggesting that complex vat dyes, mordant dyes and tannins were used in the Iron Age (*cf.* Mannering *et al.* this volume). Likewise, it demonstrates how different shades were obtained by over-dyeing and mixing dyes. Microscopic examination has attested that fleece as well as yarn and fabric could be dyed. Although the use of mordants could not be proved definitively, they must have been used for some of the colour-fast dyes.

Mending and patching were found on some salt-mine fragments, demonstrating that clothes were repaired in the Hallstatt period (Mautendorfer 2005). Four kinds of stitches were used: overcast (most common), running, stem and buttonhole stitch. Seams and hems furthermore inform us about the shape and use of prehistoric clothes. Simple seams with hemmed edges, fell seams and two varieties of hems with the edge folded over either once or twice have been found.

Grave Finds from the Hallstatt Period

Although nearly 55 grave textiles from 11

sites provide a more precise chronological sequence than salt-mine material, no particular differences between Ha C and Ha D textiles in Austrian graves have been identified. In terms of weave type, thread count and thread diameter, they are comparable to the finds from the Hallstatt salt mines in every detail.

At Führholz (Ha C), a fine tabby, made probably of Z-ply linen yarn, 0.2 mm in diameter and with a high thread count of 20 threads/cm was found. Another textile from the site is a coarser 2/2 twill in single yarn, 0.8–1 mm thick yarn and a thread count of 8/6 threads/cm (Table 1, no. 4).

Textiles from Mitterkirchen are small fragments on iron objects (Table 1, no. 10). In some cases, Z-ply yarn was used for the warp, while in others single s-twisted yarn was found. The thread count can be very high, up to 36–46 threads/cm in one direction combined with about 8 threads/cm in the other direction, creating a very dense rep weave. At Schusterwald, a coarse 2/2 twill dated to Ha C/D has S-ply warp and single s-twisted weft (Table 1, no. 14).

The Hallstatt period cemetery site with the largest number of textile finds, 26 fabrics from 22 graves, is Uttendorf im Pinzgau (Table 1, no. 16). Most textiles were found encrusted on iron knives and bronze pins. About 70 % of the textiles are 2/2 twills produced with single yarns. The textiles are relatively fine, with thread counts reaching 10–15 threads/cm. Tabby and basket weave fabrics are coarser, with 5–10 threads/cm. Seventeen out of the 26 textiles at Uttendorf have spin patterns, but unlike in the Hallstatt salt-mine finds, most of the spin patterns occur in both thread systems. For the pieces where the regularity of the spin pattern could be determined, the alternation of 8s and 8z or 12s and 12z yarns is common.

From the cemetery of Hallstatt, located in the Salzberg valley next to the salt mines, five Ha C period grave finds and a similar number of Ha D period grave finds with textiles have been published to date (Table 1.1, no. 6). The finds include iron swords wrapped with rep bands and bronze rings and knives wrapped in 2/2 twill. The rep bands are made of S-ply yarn and have a high thread count in the warp direction. One fragment of a basket weave and several 2/2 twills have almost 30 threads/cm. Spin patterning also occurs very frequently among these finds.

The few graves with textile finds dated to the Late Hallstatt period (Ha D) are geographically scattered throughout Austria. One textile from Gilgenberg is a fine tabby with 0.4 mm thick z-twisted yarn and a thread count of 14 threads/cm (Table 1.1, no. 5). In Mattsee mound 2, an iron object was found that was partly covered by a piece of fine basket weave, made of single z-twisted yarn and with a thread count of 8/15 threads/cm (Table 1.1, no. 9).

Excavations in 2006 brought to light a grave in Berg/Attergau, where organic materials such as textiles, leather, bark and wood have survived (Table 1.1, no. 1). The wooden grave chamber is dendrochronologically dated to 595 BC (Ha D1). Four different textiles were preserved next to large, bronze, spiral needles (*Doppelspiralnadeln*). All the textiles are very fine, with 0.2–0.5 mm thick yarns and 12–24 threads/cm. Different weaves are represented: one 2/2 twill made of S-ply yarn, one tabby with single s-twisted yarn and one basket weave with single z-twisted yarn. One coarser 2/2 twill has a spin pattern, which was achieved by alternating single z-twisted yarn and Z-ply yarn in one direction. All textiles from Berg/Attergau are made of wool.

Two graves from Dürrnberg dated to Ha D (graves 72 and 76) included two textiles preserved on iron axes and knives, which were fine wool twills with a thread count of 12–16 threads/cm (Table 1.1, no. 2). One of them is a lozenge twill and the other a 2/2 twill. Both are characterised by the combination of single z-twisted warp and single s-twisted weft.

La Tène Period

Late Iron Age textiles in Austria appear to be of a more uniform character. There is a greater variation of types at Early La Tène Dürrnberg, but the grave finds represent a textile repertoire that becomes less varied over time, similar to other parts of Europe (Belanová 2005 and in this volume; Rast-Eicher in this volume).

The Dürrnberg Salt Mines

The largest corpus of the La Tène period textiles in Austria was found at Dürrnberg and consists of more than 600 fragments ranging in date between the 6th and 2nd centuries BC (Late Hallstatt-Early La Tène period). They were found in the salt deposit as discarded rags and fragments; thus, no complete garments survive.

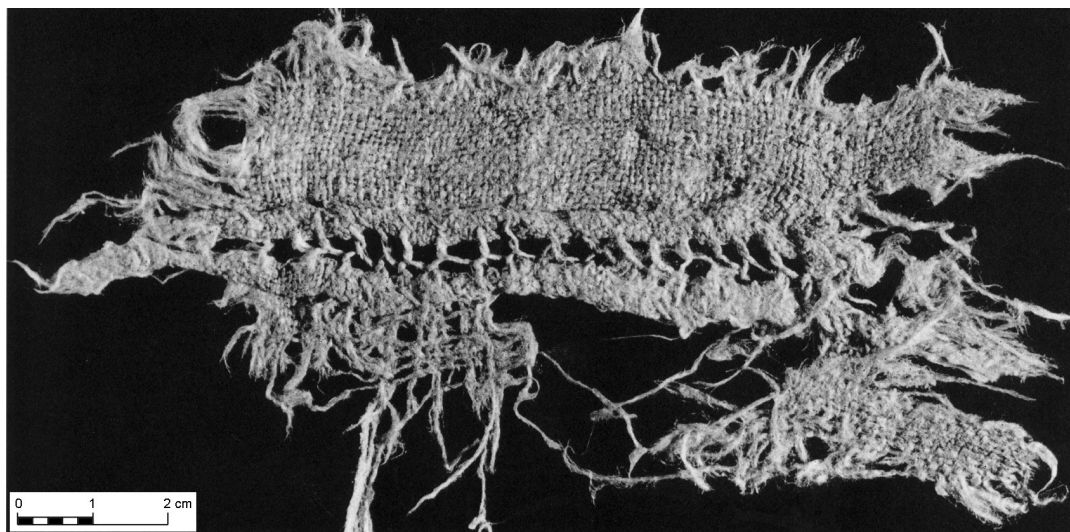
Nr.	Site	County	Date	Context	Textile No.	Description	Bibliography
1	Berg/Attergau	OÖ	Ha D1	grave	4	2/2 twill, tabby, basket weave; single and plied yarns wool; spin pattern	Grömer in Trebsche et al. 2007, 65 ff.
2	Dürrenberg	Szbg	Early Lt	salt-mine	over 600	main type wool tabby, about 25% linen; 2/2 and 2/1 twill, colour patterns (stripes), dyeing	von Kurzynski 1996, 33 ff.; von Kurzynski in Stöllner 2002; Stöllner 2005
	Dürrenberg	Szbg	Ha D	graveyard	2	Gr. 72 und 76: lozenge twill and 2/2 twill in wool single yarn	Hundt 1974, 135 ff.; Banck-Burgess 1999, 217
	Dürrenberg	Szbg	Lt A and Lt B	graveyard	28	mainly linen tabbies, few wool tabbies and wool 2/2 twill, one linen 2/2 twill, all single yarn	Hundt 1974, 135 ff.; Banck-Burgess 1999, 218 f.
3	Franzhausen	NÖ	Lt A	graveyard	2	tabbies	Neugebauer 1996, Abb. 9 and 10
4	Führholz	Ktn	Ha C	grave	2	tabby (rep) and twill, plied yarn and single yarn, linen?	Grollegger 1997, 82-83
5	Gilgenberg	Szbg	Ha D	grave	1	tabby, single yarn	von Kurzynski 1996, 111; Stöllner 1996, Taf. 13
6	Hallstatt	OÖ	Ha	salt-mine	250	wool 2/2 twill and variants, tabby, basket weave, tablet weave, spin pattern, coloured pattern (checks), dyeing, mainly single yarn	Grömer 2007a; Hundt 1959, 1960, 1967, 1987; von Kurzynski 1996, 31 f.
	Hallstatt	OÖ	Ha C and D	graveyard	10	basket weave, tabby, 2/2 twill, rep; single and plied yarn; spin pattern	Bender Jørgensen 2005, 143; mentioned in von Kurzynski 1996 and Banck-Burgess 1999
7	Kalenderberg b. Mödling	NÖ	Ha C	settlement	1	2/2 twill	von Kurzynski 1996, 111
8	Mannersdorf	NÖ	Lt B2	graveyard	9	linen tabby, single yarn	Müllauer und Ramsel 2007, 81 f.
9	Mattsee	Szbg	Ha C	grave	1	basket weave, single yarn	Bender Jørgensen 2005, 142; Stöllner 1996, 123 ff., Taf. 66A
10	Mitterkirchen	OÖ	Ha C	graveyard	4	rep, plied yarn warp, single yarn weft	Bender Jørgensen 2005, 143
11	Pottenbrunn	NÖ	Lt A2/B1	graveyard	8	linen tabby, single yarn and rep	von Kurzynski in Ramsel 2002, 369
12	Schleedorf-Mölkham	Szbg.	Ha D	graveyard	1	lost	Stöllner 1996, 139, Taf. 76B
13	Schrattenberg	NÖ	Lt B	grave	1	linen tabby in single yarn	Bender Jørgensen 2005, 143
14	Schusterwald Höch	Stmk.	Ha	grave	1	2/2 twill S/s	Bender Jørgensen 2005, 143
15	Traunkirchen	OÖ	Ha	grave	1	tabby	Stöllner 1996, 86, Taf. 44/1
16	Uttendorf im Pinzgau	Szbg	Ha C	graveyard	26	mostly 2/2 twill, some basket weave and tabby; single yarns; spin patterns	Bender Jørgensen 2005, 142-143; Banck-Burgess 1999, 218

Most Dürrenberg textiles are made of wool, but 25% of all textiles are of linen or hemp, which represents a considerable increase compared to the earlier finds from Hallstatt. The most common weave type is tabby, constituting nearly 60 % of the total number; the quality ranges from coarse to

fine. A few fragments of basket weave and rep have been found as well. In contrast, different twill variations, primarily 2/2 twill and 2/1 or 1/2 twill, constitute only about 35 % of all textiles. Only one complex twill with point repeat (chevron twill, *Spitzköper*) has been identified. Narrow bands, 4–11 cm

Table 1.1. Iron Age textile sites, their short characterisation and references, in alphabetical order.

Fig. 1.13. Dürrnberg
Nr. 2856, two textiles
sewn together (©
Deutsches Bergbau-
Museum Bochum).



wide, woven in balanced tabby have also been recovered; sometimes, the bands are decorated with stripes. Only a few fragments of tablet-woven bands were found. A common yarn type among the Dürrnberg textiles is S2z-plied yarn, which was detected in half of the finds.

In contrast to the finds from Hallstatt, spin patterning is nearly absent at Dürrnberg. The most common pattern consists of stripes, mostly multi-coloured (Fig. 1.12 top). For the striped textiles, both naturally pigmented fibres as well as threads dyed in bright colours were used. A common type of a patterned textile at Dürrnberg is a linen tabby with narrow blue and/or red stripes on a natural white background. There are also a few (wool) tabbies with a blue background and narrow blue or yellow stripes. In some cases, the striped textiles are woven in twill. The preserved selvages demonstrate that the patterns are usually made in the direction of the warp. Occasionally, checked tabbies occur as well. Usually, the checks consist of narrow stripes in warp and weft, often red or yellow on a blue background. Unique in Austria is the use of the technique of floating threads (*Fliegender Faden*; cf. Banck-Burgess, Rast-Eicher in this volume). One textile has a small S-shaped pattern, triangles and hour-glass motif (Fig. 1.12 bottom).

Recent dye analyses have demonstrated that nearly 40 % of the textiles from the Dürrnberg salt-mine were dyed (Stöllner 2005, 169). Thanks to the excellent preservation conditions in the salt, colours like reddish-brown, red, blue, bluish-green and olive-green

are still bright and intense. Probable dye sources include woad, weld, tannins and some madder types. In two cases, traces of kermesic acid and alizarin have demonstrated the use of the insect *Kermes vermilio coccioidea* for a dyestuff which must have been imported from the Mediterranean region.

The sewing techniques employed in the Dürrnberg textiles are comparable with those of the Hallstatt salt mine finds. However, two textiles found in the Ferro-Schachttricht area (Fig. 1.13) were joined by wide feather stitches.

Grave Finds from the La Tène Period

Nineteen textile finds derive from the La Tène cemeteries of Lower Austria: Franzhausen, Pottenbrunn (Lt A2–B1; Table 1.1, nos 3 and 11) and Mannersdorf (Lt B2; Table 1.1, no. 8). They all consist of linen tabbies with single z-twisted yarn. They have thread diameters of 0.3–0.5 mm and a thread count of 10–15 threads/cm. Some of these textiles were found inside hollow bronze anklets (Fig. 1.14) and are comparable to similar finds from Slovakia and Moravia (cf. Belanová-Štolcová this volume).

The La Tène period grave finds from Dürrnberg are similar to those in Lower Austria. Material consisting of 28 grave finds dated to the Lt A–B has been published (Table 1.1, no. 2). Textiles were found on bronze rings, fibulae, belt-fasteners and swords and are mainly linen tabbies with single z-twisted yarn in both directions. The yarn diameter is 0.3–0.5 mm and the thread count averages 12–16 threads/cm, similar to the grave finds from other locations. There were only three

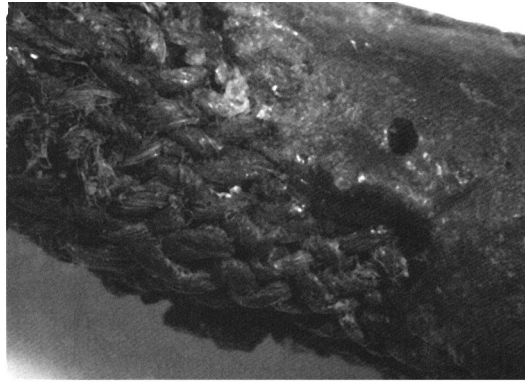
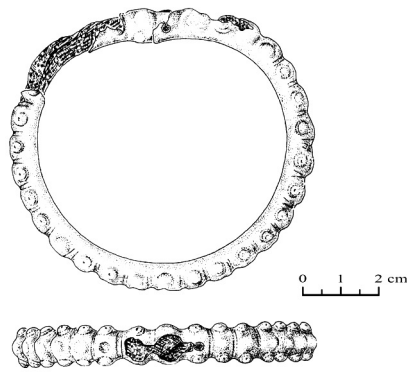


Fig. 1.14. Bronze anklet from grave 217 at Mannersdorf with textile filling (After Müllauer and Ramsel 2007, Figs 4 and 7).

wool textiles. One of these is a coarse tabby with 1 mm thick yarn and a thread count of 6 threads/cm. The other two wool textiles are fine 2/2 twills, with 24–30 threads/cm. One of them has s-twisted warp and z-twisted weft. A further noteworthy feature is a piece of 2/2 twill in linen. No spin patterning has been recorded in La Tène period grave textiles in Austria thus far.

Textile Function

The uses of the woven fabrics found in graves and in the salt mines can be interpreted in various ways, and different functions of primary and secondary use can be distinguished (Fig. 1.15). The primary use of textiles can be as clothing or utilitarian textiles. Secondary use is reutilisation after wear and tear, *i.e.* subsequent to primary use. Textiles were produced with special characteristics for a particular use. This means a specific choice of raw material, a preference for a special thread thickness and twist, the binding and its density, borders, patterns, finishing – all these production aspects were chosen intentionally, according to the intended primary function.

Unfortunately we do not have any complete textile garments from prehistoric Austria. The only complete articles of clothing are leather shoes (Fig. 1.16) and animal fur headwear from the salt mines of Hallstatt and Dürrenberg (*e.g.* Barth 1992).

Only very little information about Early Iron Age garments can be extracted from the iconography on pottery of the Eastern Hallstatt culture (Fig. 1.17), as the anthropomorphic figures depicted are very stylised (Dobiat 1982). Women are shown as big triangles with a dot for a head and lines for legs and arms. The patterns inside the triangles seem to indicate the structure or pattern of the cloth. One

of the vases from Sopron-Burgstall displays the female figures wearing an interesting bell-shaped skirt. Men are depicted as two triangles, touching at their points. Sometimes they wear what appear to be trousers or leggings.

A more informative source of information is the so-called Situla Art, which flourished in the south-east Alpine area, mainly southern Austria and northern Italy, between 700 and 400/300 BC (Lucke and Frey 1962; Frey 1969). Bronze-sheet objects such as situlae, lids, belts and scabbards were decorated with figural scenes depicting the life of the Iron Age aristocracy, including processions, chariot races, hunting scenes, sports, symposia and other activities. The scenes and the presence of mythical creatures like sphinxes or griffins demonstrate that these depictions were inspired by Etruscan and Greek art. However, men, women and even children are depicted in their local costumes in these images. The men wear long mantles and various hats, tailcoat-like garments and trousers, gaiters or leg-wrappers. The women usually have long gowns, sometimes a blouse, a skirt and a belt. The women always wear a veil; the lengths vary from shoulder-long, to the waistline or even to the lower legs. Sometimes, a hairstyle is visible around the face (Grömer and Kania 2004–05). The patterns on the garments such as criss-cross decoration may indicate the structure of the weave or pattern. The detailed depictions of edges may refer to tablet-woven or rep borders.

The images of clothes found on metal and ceramic objects can contribute to our understanding of Iron Age clothes worn in Hallstatt. For example, the seams and hems provide us with more specific details as to garment use (Mautendorfer 2005). Thus, a 22 cm long tablet-woven border (Fig. 1.10 bottom), sewn together at its ends and sewn

Primary function

Secondary function

Grave finds:

- garments of the dead person
- garments as grave goods

Bog finds:

- garments of the dead person
- offering of garments

fabrics as
grave goods

- covering of the dead body
- covering of grave goods
- wrappings for grave goods

use in similar function:
e.g. mended garments,
converted garments

garments

Bronze Age and Iron
Age garments from
bogs and burials:
mantles, dress, skirts,
blouse, girdle, leggings

coverings

secondary use
garments

FABRICS

textiles as basic
commodities

- grave find Hochdorf:
- mattress, pillow
 - wall hangings
 - coverings for the floor

- salt-mine Hallstatt
- wool carrying bags

technical
function

textiles as coverings or
linings of scabbards:
Horath

textile as inner part of
a bronze-sheet girdle:
Berg/Attersee

recycling

La Tène Period anklets
(Mannersdorf, Pottenbrunn):
textiles as fillings for anklets

- finds from salt-mines
Hallstatt and Dürrnberg:
- textiles as makeshift binder
 - „Handleder“
 - medical use: finger bandage
from Dürrnberg
 - use as cleaning rag

*Fig. 1.15. Function
of textiles from the
archaeological context in
Bronze Age and Iron
Age Austria and Central
Europe (© K. Grömer).*

onto a twill fabric, must have been a part of a garment. Perhaps it was the end of a trouser leg or a sleeve. Similar borders on sleeves, necklines, trouser legs and hems occur on images of clothes, such as the statue from Idria and a sheath found in Hallstatt (Mautendorfer 2005, Fig. 14). Images on Iron Age vessels from Sopron also display clothes made of multiple pieces, which seems common for this period. Thus, one large fragment from the Hallstatt salt mine, find spot Ender-Werk

measuring 55 x 55 cm is made of six pieces of cloth and may reflect such a construction.

Textiles from graves are usually very small, but in some cases they can reveal the type of fabric (weave, fineness) that was used for different parts of garments, tunics, mantles or trousers. However, within a funerary context, there are not only the garments in which the deceased were attired; textiles were also used as burial gifts. Thus, multi-layered fragments of a coarse wool textile found next to a belt

and spiral needle in the Ha D cremation grave from Berg/Attergau appear to be remains of a folded mantle (Grömer 2007c).

Objects in graves are often found wrapped in textiles. In some Hallstatt graves, swords are wrapped with 4.5 cm wide fine rep bands (*cf.* Möller Wiering in this volume). It has been suggested that iron swords were wrapped with oil-soaked bands to protect them from rust (Kern 2005, 8). Iron knives found at Uttendorf im Pinzgau are covered with various types of textiles as well (Table 1.1, no. 16).

Textiles connected to scabbards have been found in Gilgenberg (Ha D) and Dürrnberg graves (Lt A/B). The wrapping of scabbards with tabby was also documented at the Early La Tène period graveyard of Franzhausen (Fig. 1.18; Table 1.1, no. 3). They were most probably used for the covering and/or lining of scabbards.

Microstratigraphical analysis of the bronze-sheet belt from Berg/Attergau (Grömer 2007c), which was deposited together with needles next to the cremated remains, revealed that here, too, woven fabrics played a functional role in its construction. The decorated belt was reinforced on the inner part with strips of bark (Fig. 1.19), which was then covered with a minimum of 3–4 layers of a fine wool 2/2 twill fabric. This may have been done to make a softer lining for the inner part of the belt. The textile was folded over about 1 cm on both edges of the belt and fixed to its surface with narrow leather strips and tiny wooden pegs.

The best examples of ‘recycled’ textiles can be found in the salt mines of Hallstatt and Dürrnberg. Textiles found here are not merely fragments of the miners’ clothes lost or discarded during work. There is evidence that textiles were brought into the mine as rags; they were torn deliberately into strips and sometimes knotted together (Fig. 1.20 top). The textile rags were also used as makeshift bindings, for example, to bind together bundles of wood slivers for torches. Finds from the Dürrnberg salt mine demonstrate that textiles were used to repair broken tool hafts. An example of this was found nearly 100 years ago, but unfortunately it disappeared during World War II. It is described as a yellow checked band, which was wrapped around a broken tool haft (Kyrle 1918, Fig. 60). At Dürrnberg, there is also evidence that textile rags were used to fix iron picks in their wooden hafts (Stöllner 2005,



Fig. 12/1640). Other rags from the Hallstatt and Dürrnberg mines may have been used for cleaning, to make a soft handle or to sit or kneel on. Even in the modern mining industry at Hallstatt, there is a box for rags (*Fetzenkiste*), where old clothes are collected and taken into the mine for handling tools, cleaning the steam hammers or even faces and hands (Hans Reschreiter, pers. comm. August 2006).

Secondary seams and hems also demonstrate the reuse of textiles. One finely sewn 2/2 twill textile fragment from Hallstatt-Kilbwerk (Fig. 1.20 bottom) was clearly once part of a fine garment. The piece was folded and sewn together with wide, coarse stitches in thick yellowish yarn. The resulting shape is oblong and the object has a hole which was also surrounded by stitches. Similar oblong or oval pieces with holes made in leather were used to protect the hands from friction burns while handling the rope to convey salt through the mine shaft. Thus, the wool object is most probably such a provisional *händler*.

Evidence also exists of textile rags used for sanitary or medical purposes. A piece of soft tabby textile from Dürrnberg was probably used as a bandage for a wounded finger. It

Fig. 1.16. Early Iron Age leather shoe from Hallstatt salt mine (© Natural History Museum Vienna).



Fig. 1.17. Clothing of men and women on Hallstatt Period pottery (above) and Situla art (below). Pottery: 1–6, 11–15 Sopron, Hungary; 7–8 Nové Košariská, Slovakia; 9 Kleinklein, Austria; 10 Dietldorf, Germany. Situla Art: 16 Hallstatt, Austria; 17, 20, 37 Vače, Slovenia; 18–19, 21–25, 31 Certosa, Italy; 26 Providence, USA; 28, 32–33, 35 Welzelach, Austria; 27, 29 Magdalenenberg bei Wien, Austria; 30 Moritzzing; 34 Carceri b, Este, Italy (Nos 1–15 after Dobiát 1982; Nos 16–37 after Lucke and Frey 1962; Kuffarn Situla © Museum of Natural History Vienna).

was found as a bundle in the exact shape of a finger, fixed with a bast strip and contained a tiny wooden splint for stabilising the digit (Fig. 1.21).

Another form of textile recycling can be seen in hollow bronze anklets of the La Tène period, which are common in Eastern Austria, Moravia and Slovakia (Belanová 2005 and Belanová-Štolcová in this volume). The hollow anklets were filled with wood, clay or textiles, perhaps to keep the shape or as a result of the production process (*cf.* Müllauer and Ramsel 2007). In Austria, examples have been found in graves from Mannersdorf (see Fig. 1.14), Pottenbrunn and Schrattenberg near Mistelbach (see Table 1.1).

Textile Production

Information on Iron Age textile production can be extracted from textile tools found on archaeological sites. The majority of the surviving tools are made of fired clay, such as spindle whorls and loom weights, but some tools made of bone and metal are known as well. Tools used for the processing of fibres are extremely rare but a wooden tool from Hallstatt-Dammwiese, dated to the La Tène period (Fig. 1.22), could have been used for processing flax or for combing wool (Hans Reschreiter, pers. comm.).

It is evident from the textiles of the Hallstatt salt mine that both teasing and combing of wool was practised in the Iron Age. Spinning in the Iron Age was usually done with spindles consisting of a wooden shaft and a clay whorl. Spindle whorls are found frequently in graves and settlements (Fig. 1.23c–j). The size, weight and shape of the whorls vary between light ones weighing 5–8 g and heavier ones weighing 40–50 g. The size and weight of the whorls have a significant influence on the yarn (Barber 1991, 51–54; Andersson 2003, 25–26; Grömer 2005c). The very fine qualities of Early Iron Age wool threads (0.1–0.2 mm diameter) can only be produced with tiny, light whorls, which are known from the Hallstatt period sites. The majority of the Hallstatt and La Tène period whorls, however, weigh 10–30 g, which corresponds well to the yarn of 0.3–0.7 mm diameter, also known from the textiles. For plying threads, it is an advantage to use the power of a rather heavy whorl (40 g and more).

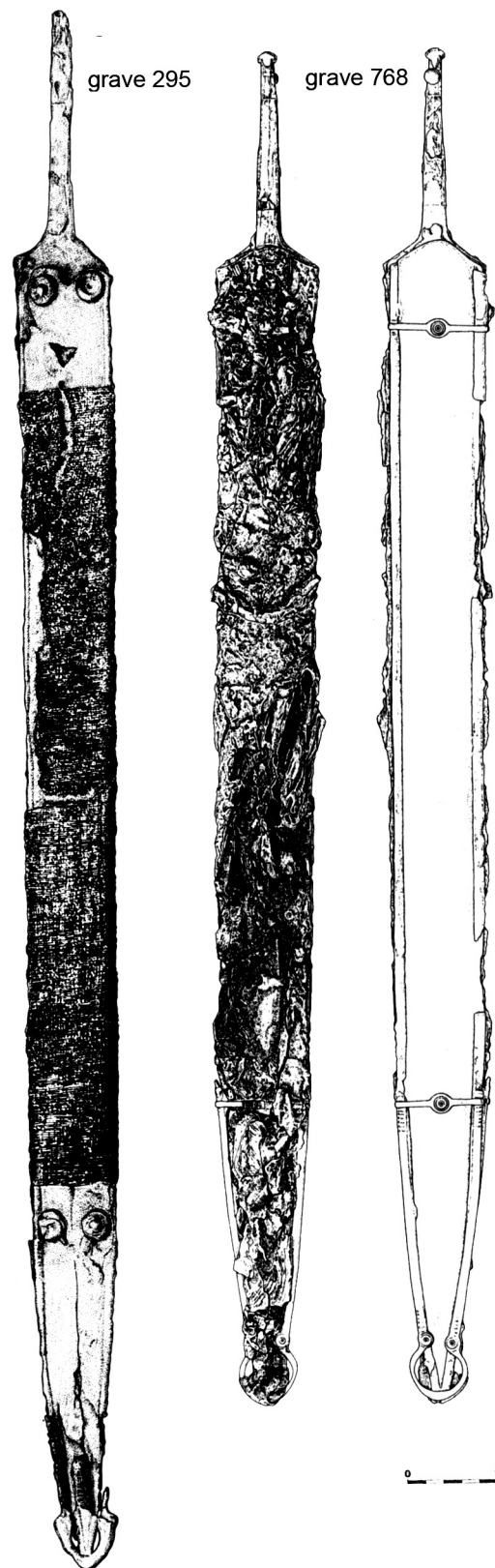


Fig. 1.18. The scabbards from the La Tène Period Franzhausen (after Neugebauer 1996).

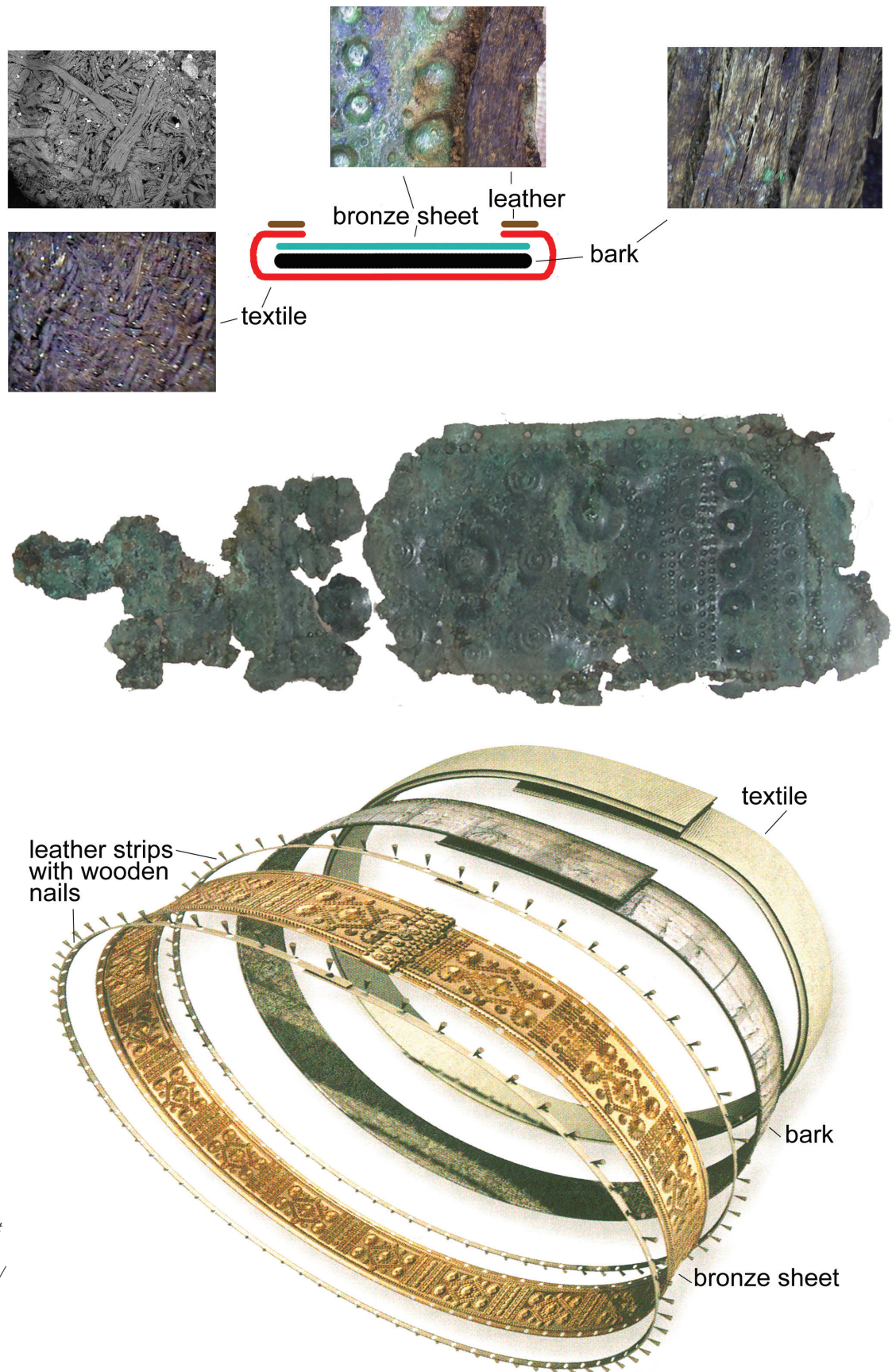


Fig. 1.19. Bronze-sheet girdle with bark and textile lining from Berg/Attergau (above: © K. Grömer; below: After Trebsche et al. 2007, Fig. 101).



Hallstatt-Textil 51 (Inv.Nr. 75.814)



Hallstatt-Textil 78 (Inv.Nr. 77.334a)



Hallstatt-Textil 121 (Inv.Nr. 89.724)



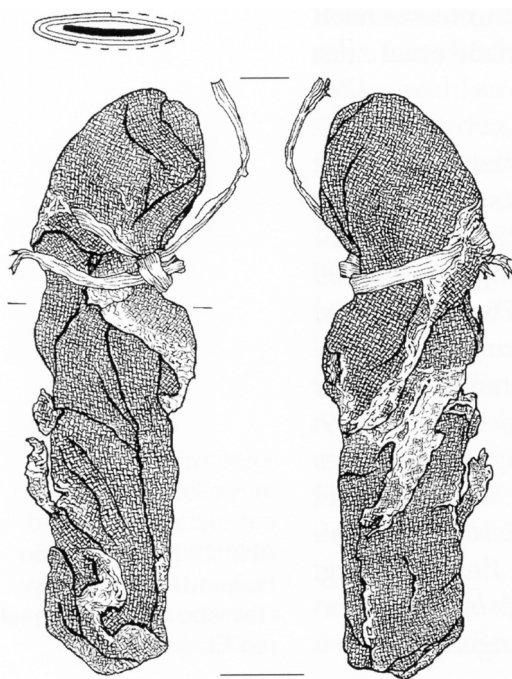
Hallstatt-Textil 160
(Inv.Nr. 89.893)



Hallstatt-Textil 97
(Inv.Nr. 79.436)

Fig. 1.20. Iron Age textiles from Hallstatt torn into strips and knotted together; bottom: textile used as provisional Handleider (© Museum of Natural History Vienna).

Fig. 1.21. Dürrnberg Textile No. 2817 used as a bandage for a finger (© Deutsches Bergbau-Museum Bochum).



The shape of the Iron Age whorls varies between conical, discoid to biconical with hollow top; the latter are typical for the Urnfield culture and the Hallstatt period. We find such whorls as grave goods in the Hallstatt cemetery. The La Tène period whorls are more commonly spherical in shape, like the one from Mannersdorf (Grömer 2005c, Fig. 1/17). During the La Tène period, pottery sherds were often reused to make spindle whorls, as at Linz-Freinberg (Urban 1994, Abb. 25, cf. Gostenčnik, Belanová-Štolcová in this volume).

Pictorial representations of spinners from the area around the Alps (Fig. 1.23a–b), the famous urn of Sopron found in Western Hungary and the *tintinnabulum* of Bologna in Northern Italy (after Eibner 1986; cf. Gleba in this volume) display women spinning in a standing position using a drop-spindle. Furthermore, they hold a short distaff with what appears to be prepared fibre. Short bronze distaffs of this type were found in a grave from Frög dated to the Hallstatt period (Tomedi 2002, Taf. 17) and in Roman period graves at Mautern (Fig. 1.23k) and Unterradlberg (Grömer 2003).

A variety of sources are available to reconstruct the technology of weaving in Iron Age Austria: the textiles themselves, sometimes

with the typical starting borders, and loom weights of clay and stone, occasionally even found in rows in houses. The Early Iron Age loom weights are usually pyramidal, although spherical, discoid or flat oval weights are also known (Figs 1.24–1.25). Sometimes the weights have surface markings, mostly crosses on top. In Austria, examples of such loom weights have been found at Kleinklein (Dobiat 1990) and the settlement of Freundorf (Fig. 1.25 left; Blesl and Kalser 2005). Stone loom weights with stripes, crosses or stars as markings are known from the graves of Uttendorf im Pinzgau (Fig. 1.25 right; Moosleitner 1992). Rows of loom weights were excavated at the Hallstatt period settlements of Michelstetten (Lauermann 2000), Freundorf and Kleinklein (Fig. 1.24; Dobiat 1990). The Kleinklein find is particularly interesting because it provides evidence for an approximately 3 m wide loom, which used 125 loom weights (cf. Gostenčnik, Belanová-Štolcová in this volume). The weights are of different shapes, sizes and weight, and some have markings on them. It has been suggested that loom weights from various looms belonging to different owners were assembled to produce this extraordinarily large weave (Dobiat 1990, 54ff).

The iconographic sources (Fig. 1.24a–b) and the loom weights indicate that many textiles were produced on a warp-weighted loom. However, the Hallstatt period depiction from Rabensburg possibly shows a horizontal ground loom (Fig. 1.24c). Other types of weaves, such as narrow rep bands or broader twill and tabby bands, may have been made on band looms. Unfortunately, no traces of such devices have survived in Austria.

Several different patterning techniques are known in the Hallstatt period, whereas their repertoire is reduced in the La Tène period. The decorating of textiles was usually carried out while weaving, without the help of additional tools. Typical for the Early Iron Age are spin patterns and colour patterns (with natural colour and/or dyed threads), combined with different weave types. During weaving, variously coloured or twisted threads were simply inserted as warp and/or weft, producing a variety of stripes and checks.

Prehistoric tablets for tablet weaving have not been excavated in Austria thus far, but spools have been frequently found in Iron Age settlements, as, for example, at Kleinklein

(Smolnik 1994, 91). Lise Raeder Knudsen suggested that they may have been used as weights in tablet weaving (Raeder Knudsen 2002 and in this volume; Gleba in this volume). Tablet-woven borders are known from Hallstatt and Dürrenberg and are made in various techniques related to the movement of the tablets (see Fig. 1.10). Warp-faced stripes were made by threading all four holes of each tablet with the same colour, but using different colours for different tablets. When weaving such a pattern, all tablets are turned in the same direction, making it the simplest technique to achieve a pattern. Other bands show motifs like triangles, diamonds and meanders. Usually, the pattern is made in a light colour, while the background is of a dark shade, ranging from green to black-brown.

Concerning the procedures for the finishing of cloth, archaeological textiles provide evidence of fulling and dyeing. Both of these techniques are present in woven fabrics from the Hallstatt and Dürrenberg salt mines, although they are more frequent at Hallstatt.

The final stage of cloth production is cutting and sewing. Shears have been found in Austria from the late Early La Tène (Lt B) onwards, for example in Mannersdorf (Fig. 1.26a) and the Pottenbrunn graves (Ramsl 2002). Before the appearance of shears, cutting was accomplished with various bronze or iron knives, which are common in graves (Neugebauer 1992; Nebelsick *et al.* 1997).

In Hallstatt, woven fabric was sometimes cut straight or diagonally and then sewn together. Iron Age needles (Fig. 1.26b–c) were found for example at Linz-St. Peter (Adler 1965, 281) and Hellbrunner Berg (Stöllner 1996, Taf. 88). They have a length of 6.8–7.7 cm and are made of bronze or iron. Multiple sewing techniques were used to sew the pieces together and to finish hems (Mautendorfer 2005). We even know of some decorative stitching, where white and blue yarns were used in a very dense topstitch (Fig. 1.26d).

Conclusions

The Bronze and Iron Age textiles from Austria allow us to follow the development of textile techniques, the use of flax and wool, single and plied yarn, weaving and patterning in the region from 2300 BC to the beginning of the Common Era (Fig. 1.27). The development of different weave types (combined with different

weaving tools), patterning techniques and the use of dyes go back to the Bronze Age and, in some instances, even to the Neolithic period (Rast-Eicher 2005). The most common Bronze Age weave in Central Europe was tabby (Early Bronze Age: linen with plied yarn; Middle Bronze Age: coarse wool with single yarn). The Middle Bronze Age finds from the salt mines in Hallstatt include the first twills, dyed fabrics and spin-patterned textiles. Textiles with coloured stripes were found in the Early Bronze Age Franzhausen cemetery, while the Urnfield site of Vösendorf yielded the earliest basket weave in Central Europe.

The loom with multiple sheds developed during the Middle Bronze Age, as demonstrated by the appearance of the twill variants. The shift to the use of more heddle rods signifies mechanised weaving and a more efficient production in terms of time and labour. This innovation was of great importance for the development of textiles in the Hallstatt period.

The early finds indicate that new developments in textile technology are not connected to the Hallstatt culture, as generally thought, although all of the techniques of decorating textiles with different bindings, colours and spin patterns do become particularly frequent during the Hallstatt period. Textiles from graves dated to the Hallstatt period also display a similar variety of techniques, indicating that the preference for this particular appearance of the textiles is characteristic for the Hallstatt culture. This phenomenon is also apparent in other materials. Thus, if we compare pottery from the Bronze Age and Hallstatt period, the ceramics of the Hallstatt Period are much more richly decorated by incision or painted in red and black with rectangular and triangular motifs. Similar patterns can be found on textiles from the Hohmichele or Hochdorf graves in neighbouring Germany as well (Banck-Burgess 1999 and this volume).

The fineness of the textiles (in terms of thread count and yarn diameter), and correspondingly, the time spent on their production increases rapidly from the Bronze Age to the Hallstatt period (see statistics in Grömer 2005a, Figs 14–16). For example, at the site of Hallstatt, Bronze Age fabrics have thread counts averaging 4–6 threads/cm and 1–2 mm thick yarns. Salt mine textiles from the same site dating to the Hallstatt period are

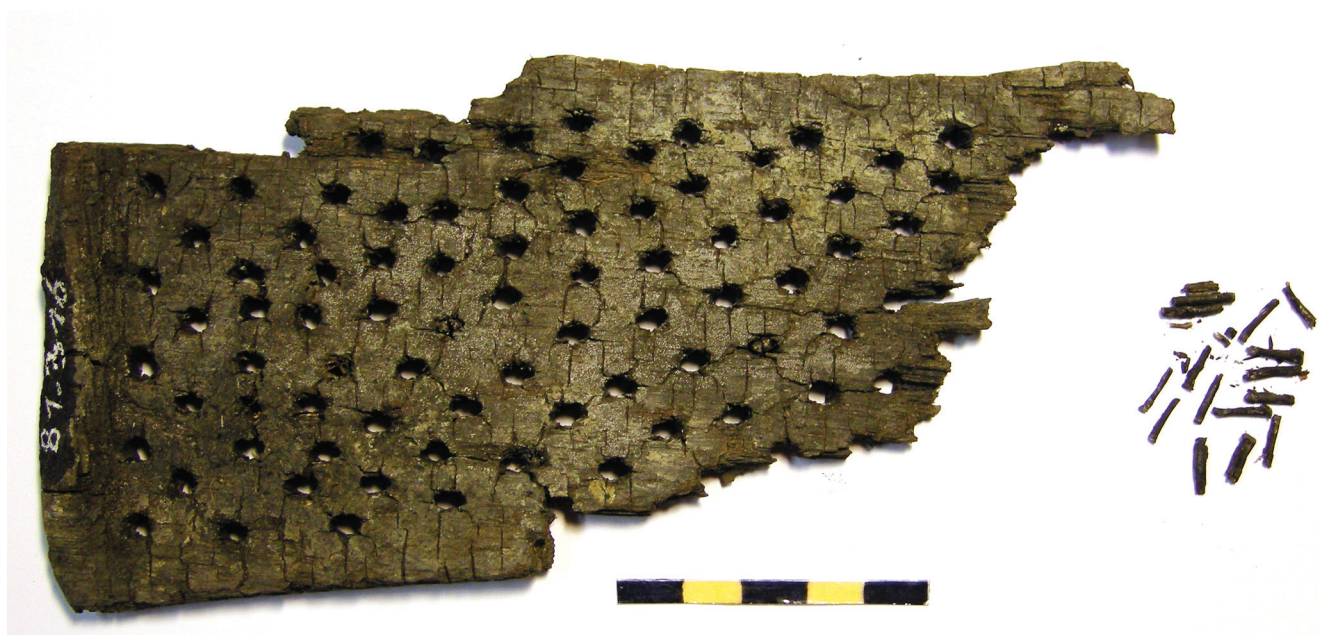


Fig. 1.22. Tool for processing flax or combing wool from Hallstatt-Dammwiese (© Museum of Natural History Vienna).

much finer with mainly about 15 threads/cm, reaching up to 40 threads/cm.

With the onset of the La Tène period around 450 BC, textile production changes again. This transformation is particularly evident when we compare salt-mine and grave textiles from the Hallstatt and La Tène periods. First, there is a clear shift from the use of wool to an increasing quantity of linen finds in the La Tène period. While a variety of twills, tablet weaving, dyeing and spin patterning have been noted among the Early La Tène Dürrnberg salt mine finds, they are less frequent than in the salt mines of Hallstatt. The Dürrnberg textiles are more standardised in thread count and yarn diameter (von Kurzynski 1996, 31–36). The very fine textile types known from the Hallstatt period are rare finds in the La Tène period and the textiles found in graves are more uniform: they are usually linen tabbies with z-twisted yarn and a thread count of 12–16 threads/cm. Only a few wool tabbies or 2/2 twills appear.

How can we interpret this change? On the one hand, the more limited range of fabrics in the La Tène graves has been seen to reflect a change in burial customs. The variety of textiles present during the Hallstatt period has disappeared and the dead of the La Tène period appear to have been wrapped in simple garments or shrouds (Banck-Burgess 1999, 47). On the other hand, it is possible that these

remarkable differences between the Hallstatt and La Tène period represent a change in textile production.

It is usually assumed that Bronze Age textile crafts in Central Europe centred around 'household production', *i.e.* production which covers only the household's own needs and uses raw material that is easily accessible (Andersson 2003, Fig. 1). Knowledge of the manufacturing process is widespread, and all or most of the members of the household possess the knowledge and skills needed to produce textiles. A more advanced 'household industry' is also organised at household level, but the production scale exceeds the needs of the producers, so that a surplus can be used for trade or exchange. The work is done in the spare time; it is not a full-time occupation. Such household industries probably existed already in the Bronze Age. In particular, the Bronze Age salt-mining site of Hallstatt must have imported 'household products': textiles, food, wooden tools and other materials from Alpenvorland, the area over 40 km away, because the entire Hallstatt population was occupied with the highly specialised and organised mining industry (Barth and Grabner 2003, 85ff).

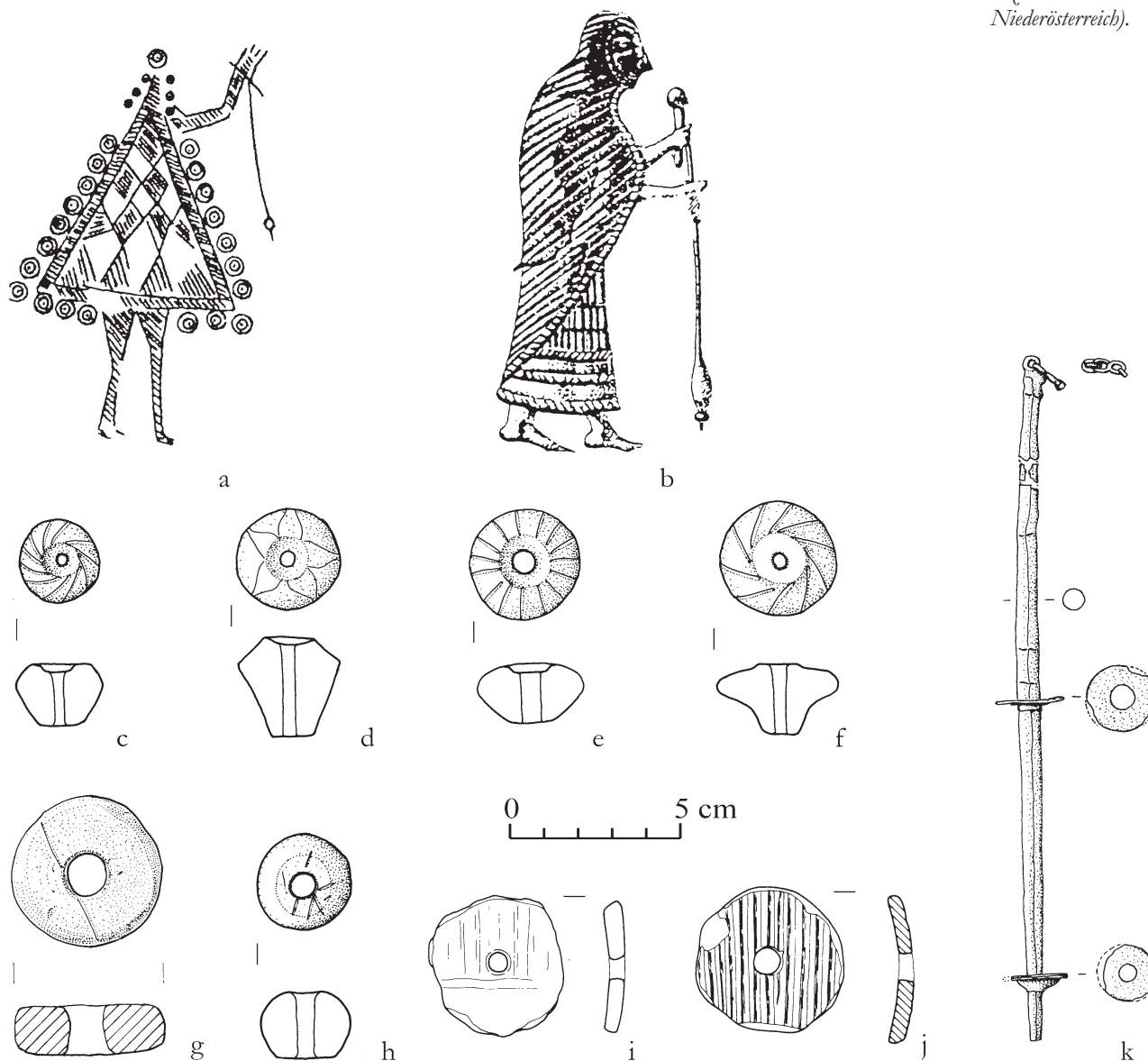
In contrast, the production of the highly developed textiles of the Hallstatt period seems to be the work of specialists. The fineness of the fabrics and the variety of weave and pattern

types indicate enormous time consumption and would have required specialised knowledge on the part of the producer. Dyestuffs such as kermes would have to be obtained through long-distance exchange. The character of the Hallstatt textiles, in fact, indicates a sort of 'attached specialised production'. This level of production is defined as production in the hands of specialists, producing on a full-time basis (Andersson 2003, Fig. 1). Such full-time work allows the specialists to enhance their skills for better quality products. Another characteristic of specialised production is that the craftspeople are supported by, and dependent on, a patron who needs the

high quality products as desirable gifts. The patron therefore ultimately controls the skills of the specialist, and it is likely that these patrons were the Hallstatt elite, who lived in centralised fortified hilltop settlements all over the Hallstatt region and were buried under large mounds (for the Iron Age social system, see Urban 2000, 227–229). The aristocracy of the Hallstatt society tried to imitate the Mediterranean lifestyle with imported goods from Greece and Etruria.

Recent analysis of Hallstatt period textiles indicates that the highly developed textile art like the patterned tablet-woven borders was produced in the Hallstatt cultural area itself and

Fig. 1.23. Depictions of spinning women, spindle whorls and Roman Period distaff: a) Sopron Vase; b) Bologna tintinnabulum; c–f) Hallstatt cemetery; g) Kuchl-Georgenberg, Hallstatt Period; h) Mannersdorf; i–j) Linz-Freinberg, La Tène Period; k) Mauern, Roman Period (a–b after Eibner 1986; c–f, h K. Grömer; g after Stöllner 1996; i–j after Urban 1994; k ASINOE: Archäologisch Soziale Initiative Niederösterreich).



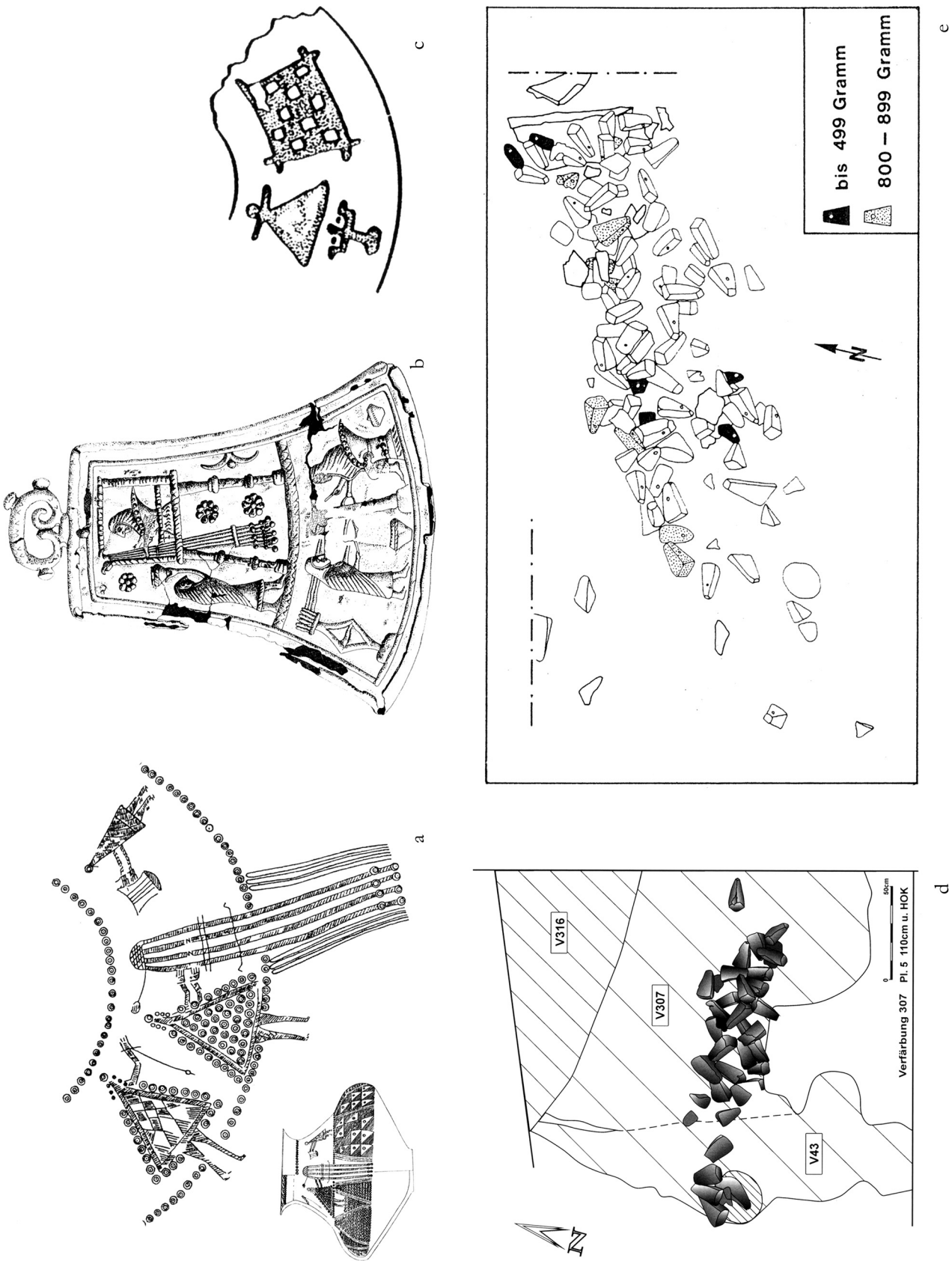


Fig. 1.24. Depictions of women working on looms and archaeological evidence of looms with in situ weights: a) Sopron Vase; b) Bologna tintinnabulum; c) Rabensburg; d) Michelstetten; e) Kleinlein (a–b after Eibner 1986; c after Franz 1927, Fig. 1; d after Lauermann 2000; e after Dobiat 1990).



was not imported from the Mediterranean area (Banck-Burgess 1999, 128ff; Grömer 2007a, 264–266). As these techniques date back to the Bronze Age, it is likely that Central Europe was an area of innovation and production of textiles in prehistoric times.

Where can we find the workshops of such specialised production in the Austrian Hallstatt culture? Some archaeological evidence from the centralised hilltop settlements provides a hint. At Kleinklein, for example, the remains of a fortified settlement with rich cemeteries in its near vicinity have been uncovered. In the settlement, a row of loom weights 3 m long was excavated, demonstrating the presence of a very large warp-weighted loom, used for weaving a very wide cloth (Dobiat 1990). A similar find is known from the settlement of Smolenice-Molpir, in Slovakia, near the eastern borders of Austria, where a specialised workshop was identified (Stegmann-Rajtár 1998; Belanová-Štolcová in this volume).

With the onset of the La Tène period in Austria, a further development of the production process took place. Although the textiles are still of fine quality in thread count and yarn diameter, they no longer show the same variety of different weave types and qualities as in the Hallstatt period. Textile production seems to have become more standardised at this point in the region, and the main fabric types (tabbies, sometimes with a striped pattern) could be mass-produced quickly and easily (von Kurzynski 1996, 35ff). This kind of mass production can possibly be connected to the ‘workshop production for trade’, i.e. direct production for the market

(Andersson 2003, fig. 1). At this level of production, the volume of output is high and the manufacturing time per item is reduced to a minimum. It is based on workers who are occupied in textile production on a full-time basis and on products that are standardised. This type of production definitely existed during the Roman period (Bender Jørgensen 1992, 126–136), but it also seems to fit well with the interpretation of the Dürrnberg site, where the salt-mining industry was responsible for the well-developed economy and a remarkable concentration of different crafts. Thus, the excavations in the Ramsautal provided insight into butchery and pottery workshops and glassworks, metal and carpentry workshops as well as general trading sites (Stöllner 2005, 171ff).

The change from individual household production to a standardised mass-production can be recognised within other facets of the material culture in the Iron Age as well. Thus, Hallstatt period pottery is handmade and is typically elaborately decorated (e.g. Nebelsick *et al.* 1997). After the potter’s wheel was introduced during the La Tène B period (e.g. Neugebauer 1992, 94–98), the patterns were reduced to horizontal stripes and bulges, made during the shaping of the vessel. Imprints of stamps are known, and it is possible to interpret some of them as seals originating from individual potters’ workshops. The appearance of the pottery becomes more uniform and standardised, as it is reduced to shapes which can easily be made on a potter’s wheel. The situation is similar in the case of wooden items: the introduction of the wood-turning lathe

Fig. 1.25. Hallstatt period loom weights of different shapes and materials. Left: round and pyramidal clay weights from Freundorf (after Blesl and Kalser 2005). Right: stone weights with decorative signs from Uttendorf/Pinzgau (After Moosleitner 1992).

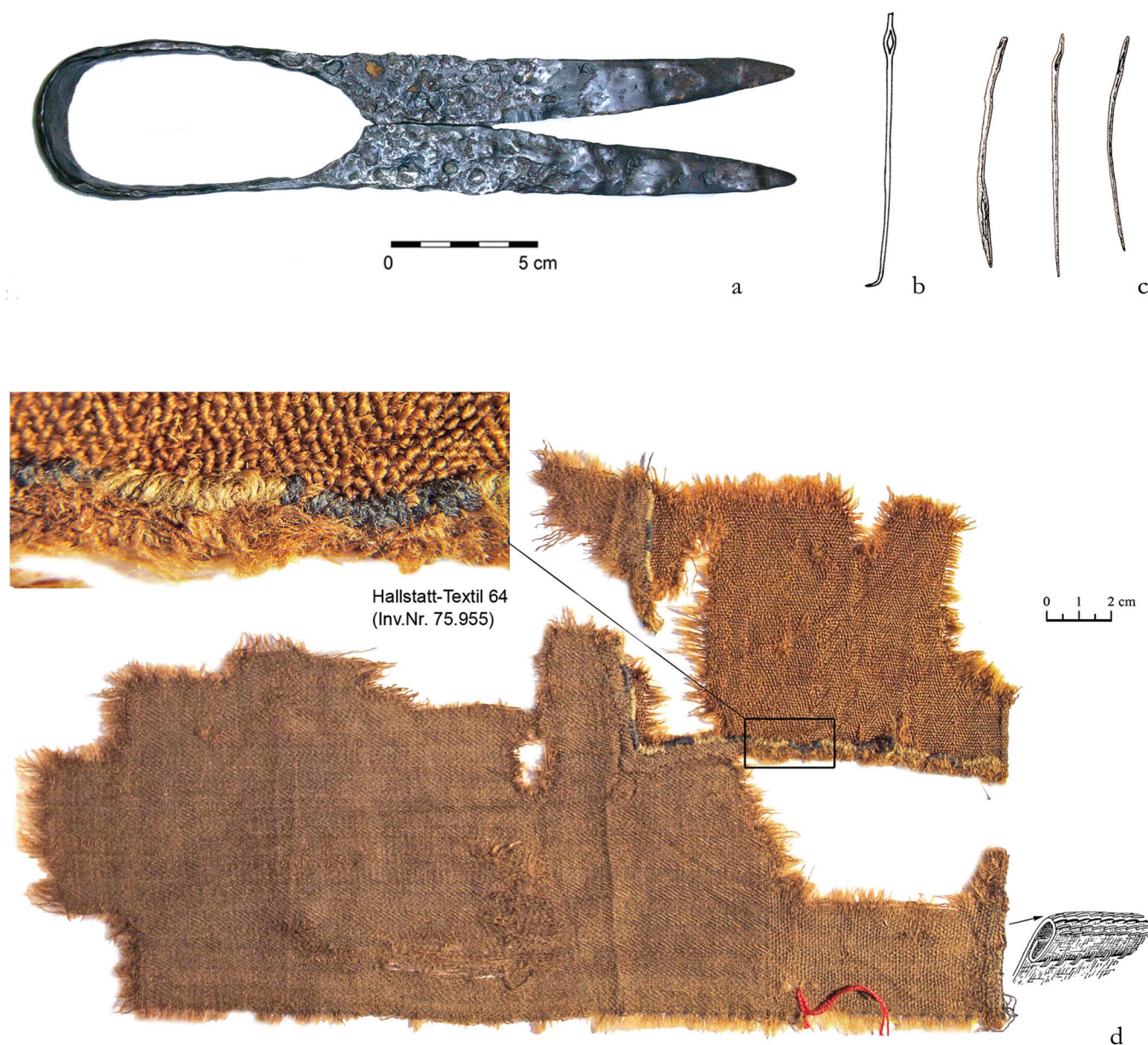


Fig. 1.26. Cutting and sewing textiles: a) shears from Mannersdorf (after Ramsel 2002); b) needles from Linz-St. Peter (Adler 1965); c) needles from Hellbrunner Berg (Stöllner 1996); d) sewn textile from Hallstatt (Inv.Nr. 75.955) (© Museum of Natural History Vienna).

allowed the mass production of wooden items such as boxes (*pyxides*), which are a common find at Dürrnberg (Zeller 1988). Standardised mass production is clearly a characteristic feature of the Late Iron Age in Austria.

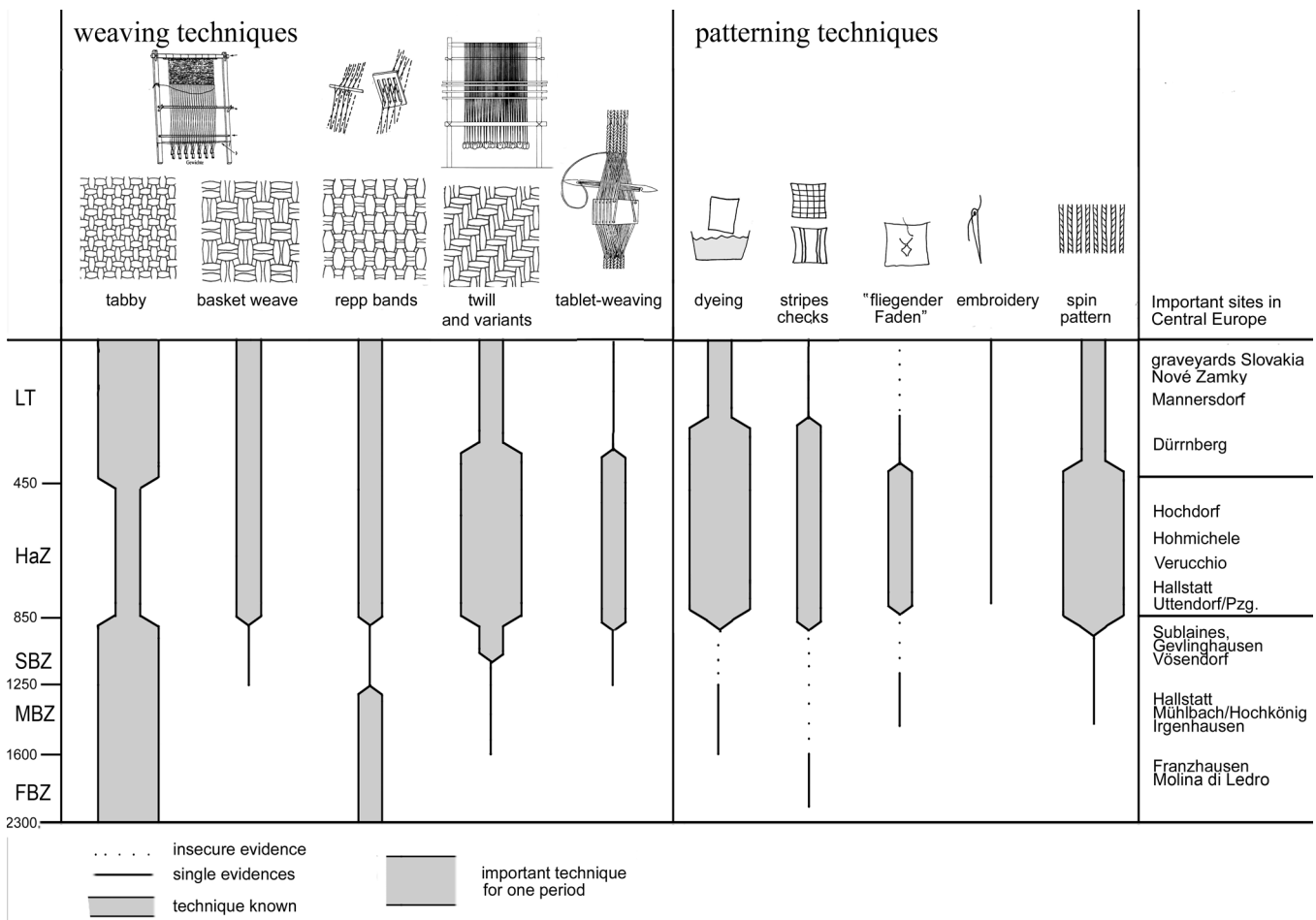
It should be kept in mind, however, that although advanced modes of textile production existed during the Bronze Age, Hallstatt and La Tène periods, household production and household industry would still have been practised for individual needs, or in smaller villages, remote areas or in times of great turbulence.

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Notes

- 1 Central European Bronze Age chronology is defined by Reinecke 1902–11 (see Cunliffe 1998, 244–276; Urban 2000, 139–224).
- 2 A textile complex consists of different textiles belonging together, for example, a textile consisting of a tabby sewn on a twill with an attached tablet border. The single textiles (fragments, pieces) would each be a part of



it – for statistical purposes for instance, it is necessary to count each individual part of a textile complex.

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Fig. 1.27. Development of textile technology in pre-Roman Austria. Comparison of weave and patterning techniques from the Bronze Age to the La Tène Period (© K. Grömer).

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Austria: Roman Period

Kordula Gostenčnik

Introduction

Textiles from the Roman period in Austria (approximately 50 BC–AD 600) survive only rarely. Therefore, a few larger fragments (of up to 29 cm in length) from early Roman Magdalensberg and a reliquary shroud (of 45 × 26 cm) supposedly from the 4th-century Lauriacum are the rare exceptions. In more recent times, archaeologists and conservators have become aware of the existence of mineralised textiles on small metal finds, which hitherto were neglected and often destroyed during the process of conservation. The number of textiles known from Austria's Roman period has thus risen dramatically during recent years and is in the process of being studied (Grömer and Kern 2008).

More work has been devoted to literary and epigraphic evidence. This includes lead *tesserae* mentioning fulleries, passages in the 4th-century AD written sources noting Noricum among the textile exporting regions in this late period, and an inscription giving evidence of a guild of textile producers (*collegium centonariorum*) in Flavia Solva at the onset of the 3rd century AD. However, textile production is best documented by refuse material and tools. If production is to be studied in detail, it is important to collect and

examine these archaeological remains, as they enable us to distinguish between commercial production and production for domestic use. Furthermore, it is also essential to distinguish those tools which indicate the social status of the owner from those that hint at textile production as a means of income. However, textile tools from Roman Austria have hitherto been completely ignored. This chapter aims to provide an overview of what has been published to date and to search for answers to the questions of if, and where, centres of textile production may be postulated on the basis of the information available.

Chronological and Cultural Background

During the mid-1st century BC, when merchants from the north-east of Italy, primarily from Aquileia, built an *emporium* on Magdalensberg in the south of what was later to become the Roman province of Noricum, the textile craft in the eastern Alps had already seen significant developments throughout the Bronze and Iron Ages (*cf.* Grömer in this volume). Now Roman fashion began to influence local garments, and this new impact is visible on tombstones from the 1st century AD onwards, especially in male

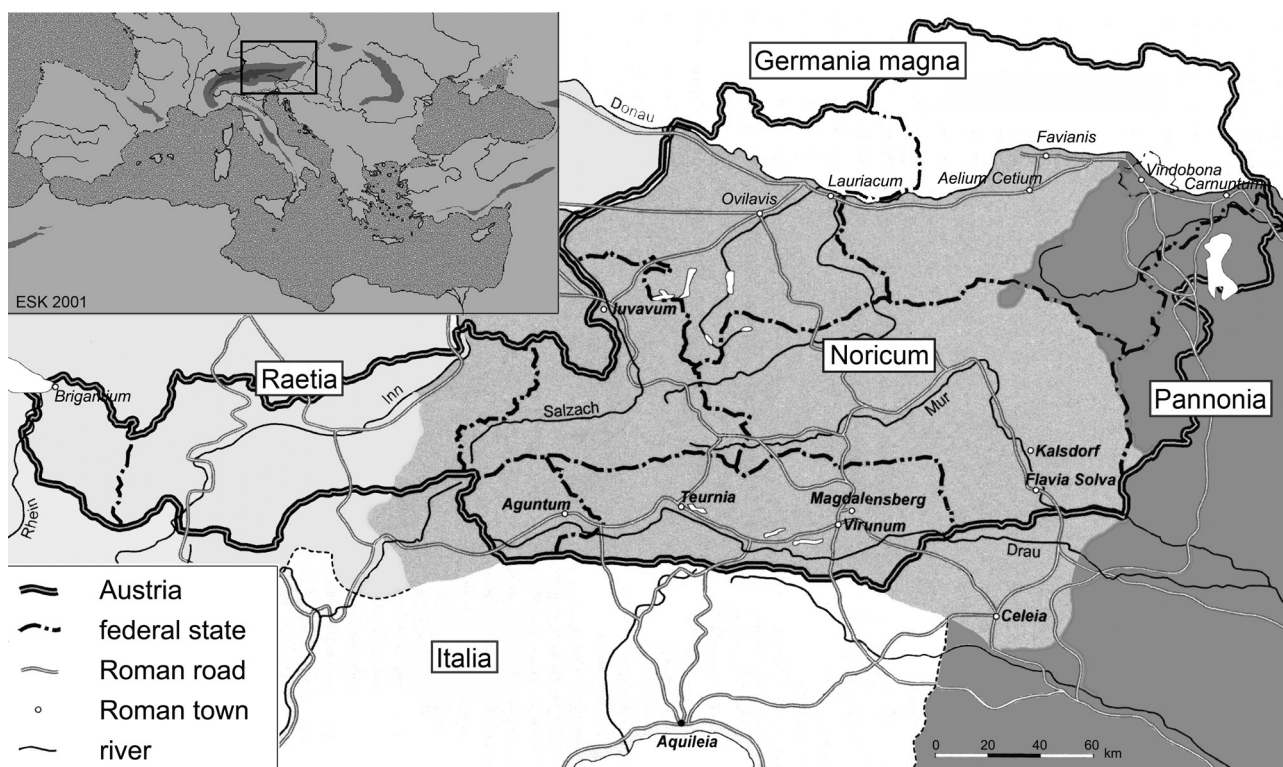


Fig. 2.1. Roman Austria (Drawing: E. Schindler-Kaudelka; addenda by K. Gostenčnik).

costume, whereas women are still depicted in their traditional attire as late as the 3rd century AD (Garbsch 1965; 1985; *CSIR Österreich, passim*). Gods or figures in mythological scenes represented in surviving reliefs, statues and wall paintings are usually depicted in Graeco-Roman attire, as both the myths and their representations were of Mediterranean origin, although some figures belonging to local tradition are known (Kenner 1985, Pls 4–8; 12–24; *CSIR Österreich, passim*).

Three Roman provinces were partly situated on the territory of today's Austria: Noricum, Pannonia Superior and Raetia (Fig. 2.1).¹ The Alps and thus the three later provinces were conquered by Rome in 15 BC during the reign of Augustus (27 BC–AD 14). The legal status of a Roman province was accorded to them under Emperor Claudius (AD 41–54), although this is disputed in the case of Raetia and Pannonia (Gassner *et al.* 2002, 81–85). Rome still claimed nominal sovereignty over the Alpine provinces and Pannonia during the Ostrogoth kingdom established in Italy under Theodoric the Great (AD 474–526) until *c.* AD 540, although, her presence and direct influence had ended decades earlier. The second half of the 6th century AD saw a brief Byzantine interlude, when the eastern

Alps were conquered by General Narses under Emperor Justinian (AD 527–565).

Being rich in metal ores, especially iron and gold, the eastern Alpine region attracted Rome's attention quite early. By mid-1st century BC, decades before the Roman invasion, southern Noricum was completely reorganised to meet the demands of Roman trade and production. The town on Magdalensberg (50 BC–AD 50) became the economic as well as the administrative centre of the region. During the later part of the 2nd century AD, a legionary fortress was established in Lauriacum on the border of the Roman Empire known as the Limes, which also gave fresh impetus to the economy of the region. When the Limes finally broke down and the Roman population of Noricum ripense was evacuated to Italy in AD 488, Roman life in the Danube region came to a standstill. The towns in the valleys and plains of southern Noricum or Noricum mediterraneum were gradually deserted or extremely reduced in size in the course of the 5th century AD in favour of town-like as well as smaller hill-fort settlements. A break in the material culture is not visible archaeologically, indicating that the same cultural background still dominated the region. This break finally occurred *c.* AD 600,

leaving a gap in the archaeological record for the next 150–200 years (Eichert 2010).

To the west of Noricum, those territories of Raetia which are situated in Austria include river valleys surrounded by the highest mountains. These valleys served as passages between the adjacent regions, and were especially safeguarded by the military in Late Antiquity (Gassner *et al.* 2002, 306–308). Only the far west, today's Vorarlberg, housed an urban settlement with a naval base on the shores of Lake Bodensee. Road stations, rural villages, *villae* or small farmsteads were in control of the Alpine valleys. While Rome still claimed her nominal authority until *c.* AD 540, the former Roman province had long been occupied by various indigenous groups of the Migration period (Wolfram 1995).

Austria's north-eastern region belonged to Pannonia superior, where the two legionary fortresses of Vindobona and Carnuntum were located at the frontier along the river Danube. Carnuntum served as the capital of the province. The hinterland was dominated by large *villae* and rural settlements along the main communication routes. Recent surveys and excavations have revealed a much more extensive Roman presence in eastern Austria in the Augustan or even pre-Augustan period than hitherto assumed (Groh 2009; Margaréta Musilová, pers. comm.). The Amber Route, one of Europe's early long-distance trading routes, passed through the territory. The smelting of iron ore was a primary means of income throughout the Iron Age, and even more so in the Roman period. As the north and east of the province abuts on what is called Germania Magna, the Roman army was frequently employed due to constant invasions of Germanic tribes from the late 2nd century AD onwards, and subsequently by the Huns and other ethnic groups. Rome ceded Pannonia to the Huns in AD 433.

Research on Textile Production in Roman Austria: Challenges and Limits

The production of textiles in Austria certainly held an important place in the economy of the Roman period. However, the possibilities of studying this role are limited due to several factors. When textile production is

considered at all, the evidence is based almost exclusively on written sources, even though conclusions based on them are extremely limited. Regrettably, many archaeologists have neglected the importance of textile production in the Roman economy, primarily due to textiles being relatively rare finds compared to other materials. Most of the textiles from Roman Austria are preserved as very small fragments. As attention was drawn to mineralised textiles in Austria only very recently, much has been irrevocably destroyed in the past. Even so, what is left still reveals most interesting clues in terms of both production and usage. Excavation reports usually focus on a limited number of objects that contribute exclusively to the understanding of site chronology, and therefore published data on textile tools and implements are very limited. To change this situation, thousands of storage boxes all over Austria would have to be examined for textile tools.

Agriculture in Austria in the Roman period has hitherto not been studied in detail. Although hundreds of *villae* and smaller farmsteads are reported, the study of the basic ecological conditions of the many different regions has thus far been neglected. The study of transhumance, sheep breeding, dairy farming and wool production is still in its infancy as far as the Roman period is concerned. In certain regions, transhumance is recorded as early as the Bronze and Iron Ages, if not earlier (Cerwinka and Mandl 1996; Urban 2000, 187). Transhumance in the Roman period is attested by surveys and excavations in Slovenia to the south of Austria (Jana Horvath, pers. comm.; *cf.* summary in Cevc 2005). Intensive surveys in the Austrian Alps were conducted in high mountain areas to ascertain mountain trails, for example in the Dachstein massif (*cf.* for instance Cerwinka and Mandl 1996). A detailed investigation of transhumance in Roman Austria has not been conducted yet, although various regions have been studied, for example the western Alps (Segard 2009).

As to the cultivation of flax and dye plants, studies focusing on botanical remains are also extremely rare. Various dyes are mentioned on lead *tesserae* (Römer-Martijnse 1990; Martijnse 1993), but where they were produced – *i.e.* locally or abroad – remains open to question.

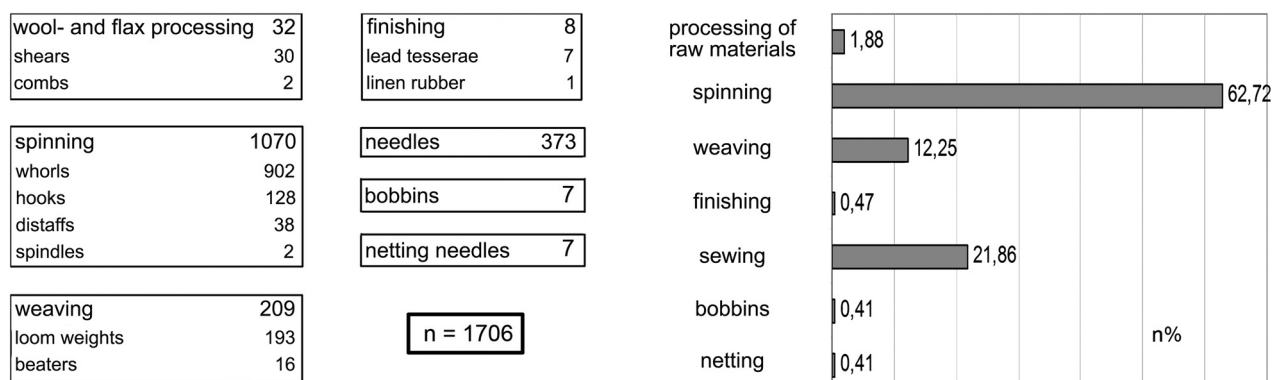


Fig. 2.2. Magdalensberg textile tools, statistics (After Gostenčnik 2009, Fig. 1).

Textile Tools

Towns, villages or *villae* in Austria have produced numerous examples of textile tools.² Their distribution, however, is uneven, as the number of tools recovered varies considerably from site to site, which probably reflects differences in the economies of the excavated locations and regions. Likewise, when durable raw materials were employed, they are present in the archaeological record while the survival of tools made from wood or other perishable materials is limited. Furthermore, changes in the preference of raw materials, *e.g.* making spindle whorls from wood instead of fired clay, or the introduction of the two-beam loom instead of the warp-weighted loom should also be taken into account, as they further complicate the analysis.

Textile Tools from Towns and Villages

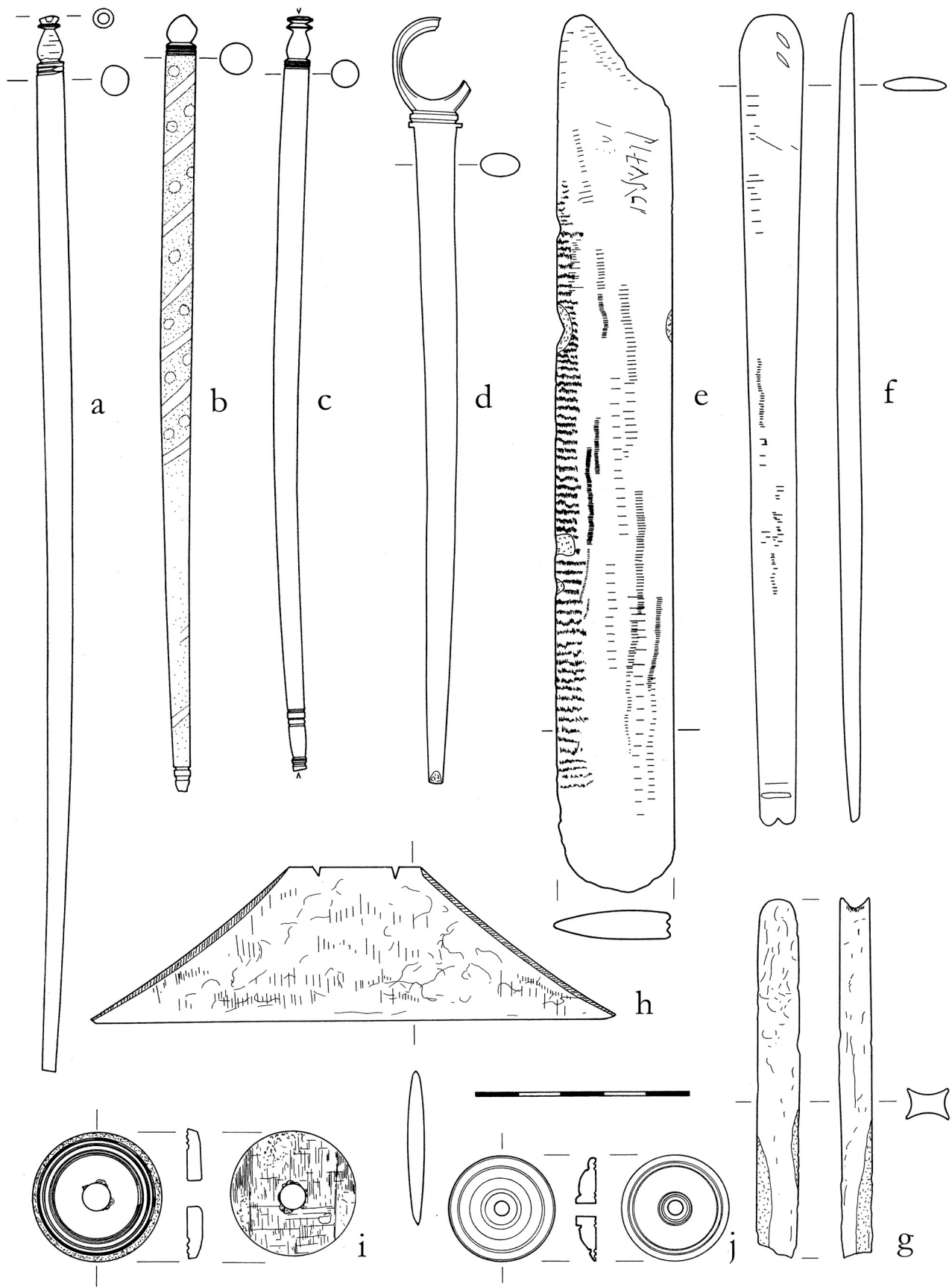
'Old Virunum' / Magdalensberg

The Early Roman town 'Old Virunum' on Magdalensberg (see Fig. 2.1), which flourished for merely a century (*c.* 50 BC–AD 50), is the only site in Austria where textile production has been considered on the basis of the tools.³ Textile production certainly was one of the most important branches of the town's economy and was most likely established for trading purposes. Northern Italy was one of the central regions and markets of the Roman textile trade⁴ and the various commercial connections of the many merchants engaged in this activity may well be regarded as the origins of textile production in Noricum's south. Several Aquileian merchants are known at Magdalensberg, although unfortunately

none are explicitly connected to the textile business.⁵ Even so, graffiti in the storage vaults of one such merchant of Magdalensberg attest to the production and sale of iron and bronze merchandise in wholesale quantities as far as Rome (Egger 1961). Due to the country's richness in iron ore and the local tradition in steel manufacturing (*ferrum Noricum*), production must have been cheaper than in Italy. The Magdalensberg textile production and trade were possibly organised in a similar way, and at least one of the lead labels (*tesserae*) found at the site hints at connections with Padua (see below).

Flax and wool processing were most probably carried out in the countryside, although some tools have been found at Old Virunum (Fig. 2.2). The production chain at the site started with spinning, which was carried out on a large scale as attested by 1070 tools or 62.72 % of the total number of implements (see Fig. 2.2). Spinning tools include spindle whorls, distaffs and ring-distaffs made of precious materials such as bone, glass and amber (Figs 2.3–2.4). Such tools are often recorded among female grave goods throughout the Roman Empire (see below). The small quantity of these prestige items suggests that the most common implements for spinning were wooden spindles with whorls made from pottery sherds. Only 36 out of the 902 whorls are not made from recycled pottery (Fig. 2.4d–e). The same cheap material was already in use during the La Tène period in the eastern Alps (*cf.* Belanová Štolcová and Grömer 2010, 12, Fig. 3.4; Grömer, Belanová-Štolcová in this volume). Whether the preferences in the raw materials for whorls might also reflect contemporaneous customs in north-eastern Italy is a matter for further enquiry (*cf.* Chiabà 2003, n. 33).

Fig. 2.3. (opposite) Magdalensberg textile tools in worked bone: a–c distaffs; d ring distaff; e–g beaters; h bobbin; i–j whorls (After Gostenčnik 2005a, Pls 52–58).



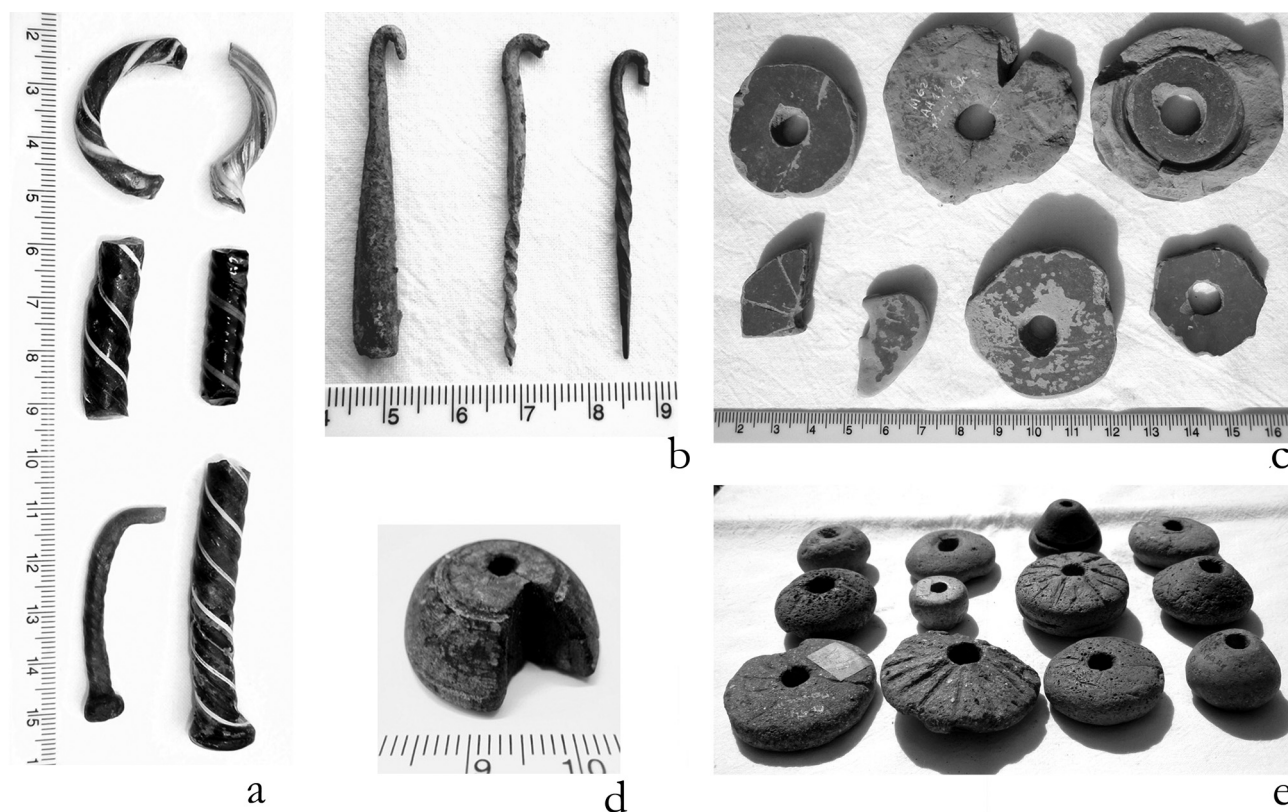


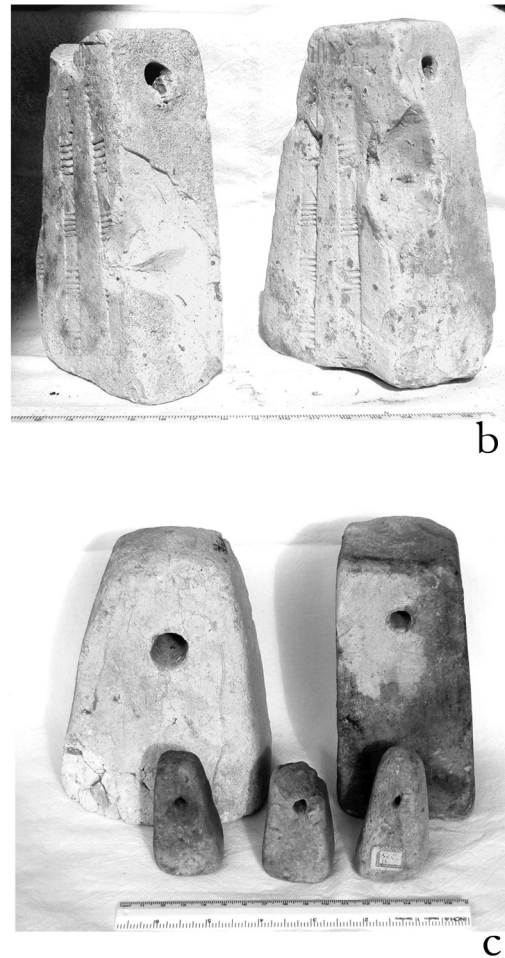
Fig. 2.4. Magdalensberg spinning tools: a glass ring distaffs; b bronze hooks; c whorls from broken pottery; d wood whorl; e whorls from baked clay (After Gostenčnik 2009, Figs 4–7).

A characteristic spinning tool at Magdalensberg is a spindle hook in copper alloy with twisted or sometimes plain shank (Fig. 2.4b); two of the numerous implements have a tubular socket (Gostenčnik 2000; 2001; 2003). The spinning hooks with twisted shanks are also reported from a few sites in southern Noricum, but do not seem to spread much beyond this territory. They are, however, very common in Roman Egypt and among Germanic tribes in the Oder-Vistula region in Poland from the La Tène to the Migration period. Apart from fixing the yarn in place during the rotation of the spindle, the exact function of this tool is unclear. Bone spindles sometimes have notches at their tops serving to fix the thread. The most common Roman period spindle (in wood or bone) is biconical and the thread is fastened during rotation by a simple loop (see Deschler-Erb 1998, Pl. 13 for various bone spindle types). On rare occasions, the top of the spindle is shaped like an arrow.⁶

Thirty-eight distaffs and ring-distaffs in bone and glass (Figs 2.2; 2.3a–d; 2.4a) is a rather small number compared to the number of spindle whorls, and they are not very likely

to have been tools for daily use, although use wear is evident, at least on the bone artefacts. The bone distaff types (Fig. 2.3a–c) found throughout the Roman Empire in the 1st and 2nd centuries AD are also made of ivory (see also on graves below). They figure among prestigious personal items and suggest the high social status of their owner (König 1987; Cremer 1996; Trinkl 2004). Glass ring-distaffs were found among large quantities of destroyed merchandise in the debris of a burnt warehouse on Magdalensberg.

About 12.25 % of the Magdalensberg textile tools have been used for weaving, among these 193 loom weights (Fig. 2.5). Complete sets of weights or remains of looms *in situ* are not recorded as yet. The weights normally appear as single items or in groups of two or three among household refuse. A set of 18 is a rare exception. The loom weights are relatively coarsely made. Apart from the usual fired clay or loam, several of the Magdalensberg weights are also made of mortar. The commonest shape is a truncated pyramid on a square base, always manufactured rather coarsely, whereas the pyramid on a rectangular base is rare, slender and more carefully made. Among



the latter is an example made of yellow clay, which was imported from north-eastern Italy (Fig. 2.5b).

A bone sword beater bears the name *P(h)ilargus* in genitive (Fig. 2.3e), hinting at a male slave working as a weaver (Gostenčnik 2005a, 238–240 and 351, Pl. 56.1; Gostenčnik 2008a, 171, Pl. 3.38). Finishing installations such as a fullery have not yet been found, although such establishments most definitely existed to meet the town's demands (Egger 1967). This is further underscored by 24 sherds of Richborough 527 type amphorae used for alum transport (U. Ehmgig, pers. comm.), although this substance was not exclusively utilised for fulling and dyeing.

Three hundred and seventy-three needles in bronze and iron accounting for 21.86 % of the total number of tools (see Fig. 2.2) illustrate the significant role of sewing in the production chain. A hoard of 45 iron needles (Fig. 2.6a) was found in the debris of the burnt warehouse

on Magdalensberg mentioned above; probably they had been stored there for sale. Although clothes were generally woven to shape, there still were hems to be fixed or seams to be made. Besides spinning and weaving, the sewing of cloth must have been an important activity on Magdalensberg.

The textile tools found at Magdalensberg are always mixed with household refuse. Therefore, production was most likely organised at the level of household production (cf. Drexhage *et al.* 2002, 111) and not in specialised workshops.

Virunum/ Maria Saal

The town which succeeded Old Virunum on Magdalensberg by the mid-1st century AD is also called Virunum. Built on the Zollfeld plain some 10 km to the south-west of the mountain, it was one of the eight autonomous towns (*municipium*) of the province and its capital until the late 2nd century AD (cf. Piccotti 2002, 103–134). In contrast to Old Virunum/

Fig. 2.5. Magdalensberg loom weights: a overview; b import from north-eastern Italy; c sizes (After Gostenčnik 2010, Fig. 14.9).

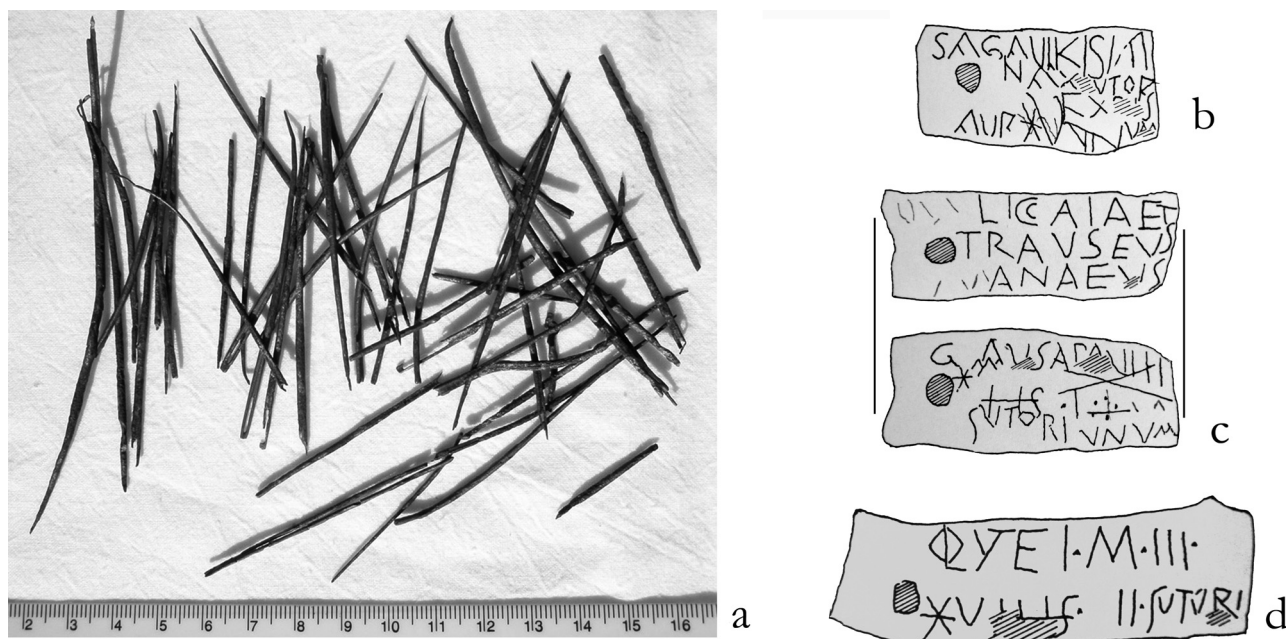


Fig. 2.6. Magdalensberg: a needle board (After Gostenčnik 2009, Fig. 14.13b); b–d lead tesserae (After Egger 1967, Figs 1–2.4.10).

Magdalensberg, textile tools at Virunum are rare. Ten years of excavations within the *insulae* on the western fringes of the town passed without a single loom weight or spindle whorl being recovered. Only a handful of needles in bronze and iron, a fragment of a bone distaff similar to those illustrated in Figure 2.3a–c, and one spindle hook with a tubular socket were unearthed (Zabehlicky-Scheffenecker and Gostenčnik 2002, Figs 8.87–88; Gostenčnik 2006, Pl. 4.38). In the course of excavations within a suburban *vicus* some 2 km to the north of Virunum, four spindle hooks (one with a tubular socket) were found in a 1st-century AD context (Dolenz 2003, 134, Fig. 12). No other textile tools except for a few needles have been excavated, suggesting that spindles and whorls were made of perishable materials.

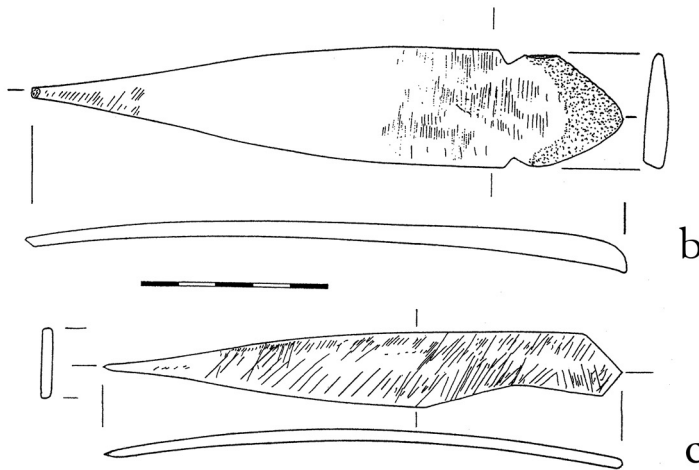
During rescue excavations in Virunum's northern quarters, structures which were interpreted as remains of a *fullonica* were unearthed (Dolenz and Polleres 2004). The building and its adjoining grounds also yielded 30 loom weights of various shapes (Fig. 2.7a), among these one made of mortar (Gostenčnik 2010, 86–87, Figs 14.17–14.19; Gostenčnik in prep.). It appears that this workshop was active in the late 2nd century AD, and possibly even earlier. The weights were not recovered in sets, but scattered in various places (Gostenčnik 2010, Fig. 14.17), as the building and its surroundings were reorganised several times

over the centuries. Since the complex was unearthed during rescue excavations, only those parts which were later built over were examined down to the virgin soil level. Nevertheless, the distribution of the weights indicates that between five to ten times more material could still be present in the unexcavated areas. As to the fullery, it is rather small and, besides two basins, no further installations are present in the main room of this workshop. It was probably equipped with portable constructions for the vats instead of niches as depicted on a fuller's tomb-relief from Sens in Gaul (Wild 1970, Fig. 73; Miko Flohr, pers. comm.). How such small establishments might have managed larger quantities for trade remains a question. Considering that excavations mainly focus on the town's centre, it is possible that workshops of considerable size might well have existed on the outskirts of the town, but have not yet been found.

Excavations within an *insula* called *Bäderbezirk* located in the town's centre during the late 19th and early 20th centuries produced only an extremely small number of textile tools such as an iron comb (Fig. 2.7d), two pairs of shears, two loom weights, two spindle whorls from recycled pottery and one in glass, and four beaters made from cattle ribs (Praschniker and Kenner 1948, Figs 116–141; on the bone beaters cf. Gostenčnik 2006 and 2010b, *passim*; Fig. 2.7b–c). As of 1993, 19 lead *tesserae* have

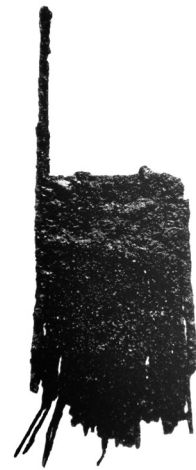


a



b

c



d

been published (Martijnse 1993, catalogue Nos 88–106), recovered mainly by looters. The inscriptions attest to finishing establishments, one naming a *fullo* (Martijnse 1993, 162, No. 92), and others mentioning colours.

Flavia Solva/Wagna near Leibnitz

In the south-east of Noricum, the autonomous town (*municipium*) known as Flavia Solva flourished from the reign of Augustus until the 4th century AD (cf. Hudeczek 2002). Although a complete inventory of the textile tools for the site is not yet available (but see summary in Gostenčnik 2008b), the extraordinary number of several hundred loom weights has been noted (Wedenig 2008). The average weight ranges between 0.7 and 1.4 kg. Unfortunately, the site is poorly published and chronological sequences within this town are rare and based on selected contexts (Groh 1996; Hinker 2006), which make it difficult to follow changes

in production over the centuries. Even so, the shapes of the loom weights are quite uniform, most of them being a slender truncated pyramid with a rectangular base (Fig. 2.8a–c). At least 125 weights from Flavia Solva are marked with graffiti on top or on the sides (Wedenig 2008; cf. Cottica 2003, Figs 4–5) (Fig. 2.8a–b). A graffito (Fig. 2.8b) appears to represent a sleeveless dress made from a checked cloth. Textile tools other than loom weights are, on the other hand, not abundant. They include shears, two flax combs and an iron wool comb (or comb beater?) with a length of approximately 10 cm (Fig. 2.8d) from *insula XXII*, where many loom weights were discovered and workshops housing several handicrafts were located. The latter is the only specimen of this type known from Austria. Tools for band weaving were found, too, including a weaving tablet in bone and a rigid heddle in bronze. A similar tool is known from Lauriacum (see below). Spindle

Fig. 2.7. *Virunum*, loom weights and beaters (a after Gostenčnik 2010, Fig. 14.18; b–c after Gostenčnik 2006, Pl. 4.36–37; d after Praschniker and Kenner 1947, Fig. 135.8044).

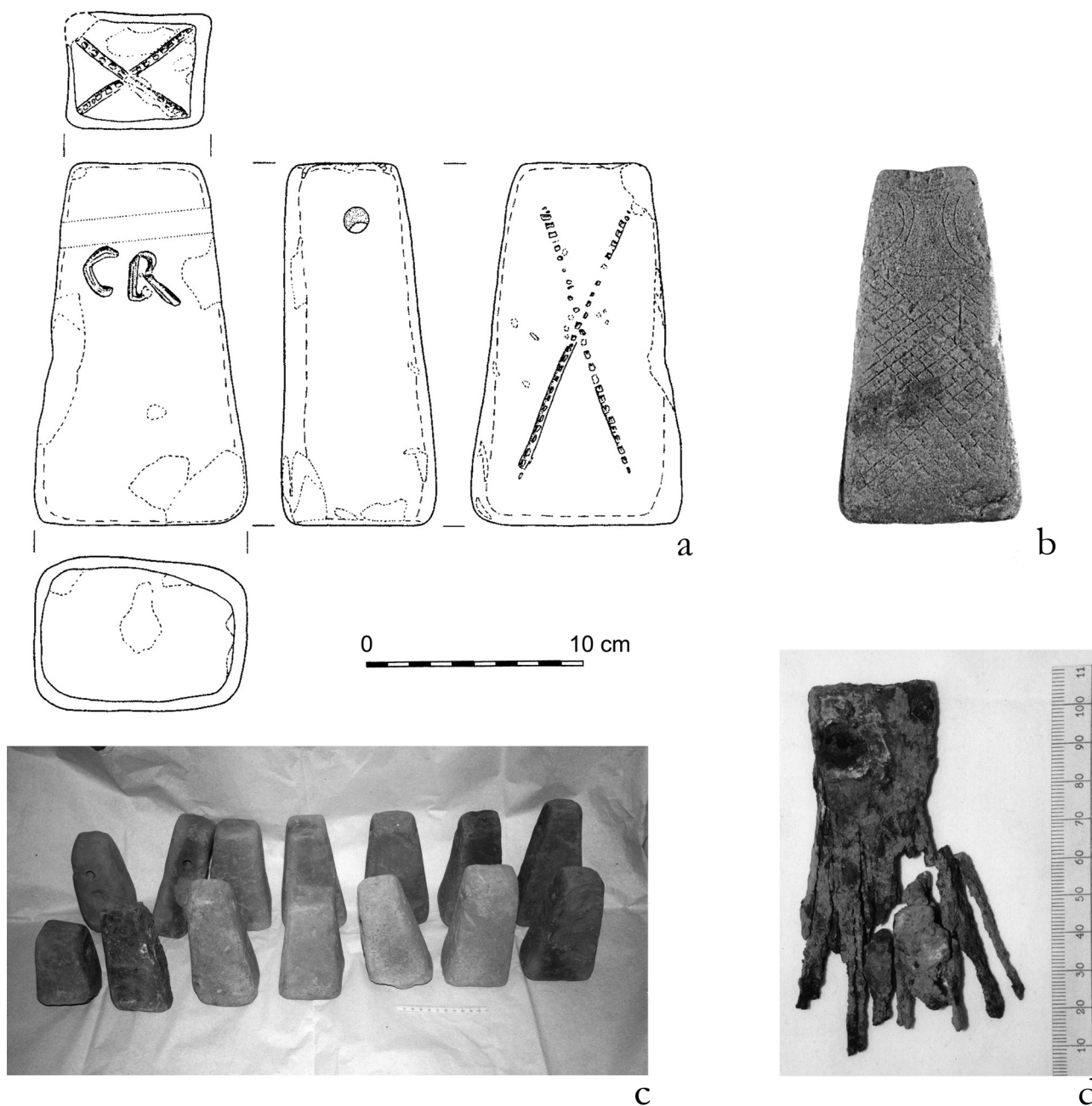


Fig. 2.8. Flavia Solva: a–c loom weights (a–b after Wedenig 2008; c photo CRAFTS Noricum, K. Gostenčnik); d comb (Photo: K. Gostenčnik).

whorls, hooks and needles are few compared to Old Virunum/Magdalensberg and seem to be primarily household utensils. Distaffs, spindles and whorls in bone and glass are also few.

Finishing, fulling or dyeing is attested by several of the 85 lead *tesserae* recorded up to 1993 (cf. Martijnse 1993, Nos 1–85; cf. *T.E.NOR*), although not a single fullery has been identified as yet. An inscription, the decree (*rescriptum*) by

the emperors Septimius Severus (AD 197–211) and his son Caracalla (AD 211–217) directed to a *collegium centonariorum* in Flavia Solva (Lafer 2001 and 2003, including bibliography), attests the production of low-priced textiles (Liu 2009, *passim*; Liu forthcoming). The yarns for weaving were spun outside the town, but it is hard to ascertain where, as the economy of the territory of Flavia Solva has not been studied in detail. At least among finds from the *villa* on

the town's territory, spindle whorls and loom weights seem to be quite common among the recorded finds (Barbara Porod, pers. comm.). Whether yarn may have been imported (e.g. from the adjacent regions in Pannonia or farther south in the Balkans) is open to debate. If five spinners are needed to supply a single loom (Wild 2002, 8–9), textile production in Flavia Solva most certainly provided a means of income for numerous inhabitants. Moreover, at the other end of the production chain, the collection of used textiles and rags was definitely well organised, as the members of the *collegium centonariorum* would otherwise have had difficulty in obtaining their raw materials.

Based on the hundreds of loom weights, the presence of several textile dealers or *centonarii* (the *rescriptum* lists 93!) and to some extent also the lead labels, it may be concluded that textile weaving (and finishing) and additionally the processing of used textiles took place in Flavia Solva on a scale significantly above mere subsistence needs. This underscores the pre-eminence of the textile business in the economy of Flavia Solva, making it unmistakably a centre of textile production and trade in Roman Austria.

Kalsdorf

Within a nameless Roman village (*vicus*) under today's Kalsdorf on the territory of Flavia Solva and some 20 km to the north of it found (see Fig. 2.1), a hoard of 201 lead *tesserae* was during construction work in 1979 (Fig. 2.11a–c). A number of these *tesserae* were related to fulleries and their activities (Römer-Martijnse 1990; see below), although no structures to which they may refer have been found. Textile tools in this settlement are reported in low numbers (some whorls, hooks, weights) and seem to be merely household refuse (Lohner-Urban 2009, *passim*). If the lead labels were actually collected in Kalsdorf in antiquity – although these *tesserae* might have originated from elsewhere as scrap metal to be reused – this *vicus* must have housed a fulling establishment. Judging by the low number of textile tools, it most likely met the demands of the local inhabitants for cleaning or dyeing textiles.

Favianis/Mautern

Loom weights are regular finds in the contexts of the 2nd to 4th/5th centuries AD in the

village (*vicus*) that was attached to the military fortress known as Favianis, located on the Danube Limes in Noricum (cf. bibliography in Groh and Sedlmayer 2006, 751–767). Tools for spinning and sewing – six combs and sword beaters in bone and five spindle whorls (Groh and Sedlmayer 2006, 415–419) – are not numerous and do not indicate organised professional production. Favianis has numerous workshops of various handicrafts, so it is not unlikely that weaving should have been undertaken on a larger scale to meet the demands of the army. However, as long as the total quantity of textile tools from this site is unknown, Favianis' position as a centre of textile production is difficult to evaluate. Even more difficult to ascertain is the position of the Roman army as an agent in the textile industry of Roman Austria, as no written records exist. Wholesale quantities of textiles were definitely produced outside the immediate surroundings of the fortresses in the hinterland, possibly also in adjacent provinces or even in faraway regions of the Empire, as otherwise dozens or hundreds of weavers would have been employed at the same place (cf. Wild 2002, 29–31 on the evidence for Britannia).

Lauriacum/Enns-Lorch

Although Lauriacum dates back to the 1st century AD, the construction of the legionary fortress towards the end of the 2nd century AD gave a great impetus to the economy of the whole region and beyond. It saw its heyday during the 3rd–4th centuries AD (Ubl 2002, 257–276). Extensive excavations were carried out in the 1950s, producing an enormous quantity of material, but textile tools were rare finds. However, a complete set of 25 weights (Fig. 2.9a), likely from a single warp-weighted loom and weighing approximately 1 kg each was found. Also, one hook with a tubular socket (Fig. 2.9c), a few whorls and some bone distaffs were recovered from graves (Fig. 2.9b; Ubl 1997, 177–180, 189). A rare piece among the textile tools from Austria is a late Roman bronze rigid heddle (Fig. 2.9d; Wieser 1999).

Aelium Cetium/St. Pölten

The autonomous town (*municipium*) Aelium Cetium was founded in the reign of the emperor Trajan (AD 97–117). Its Roman layers are now located under the modern town (Scherrer 2002). Six lead *tesserae*, a few whorls

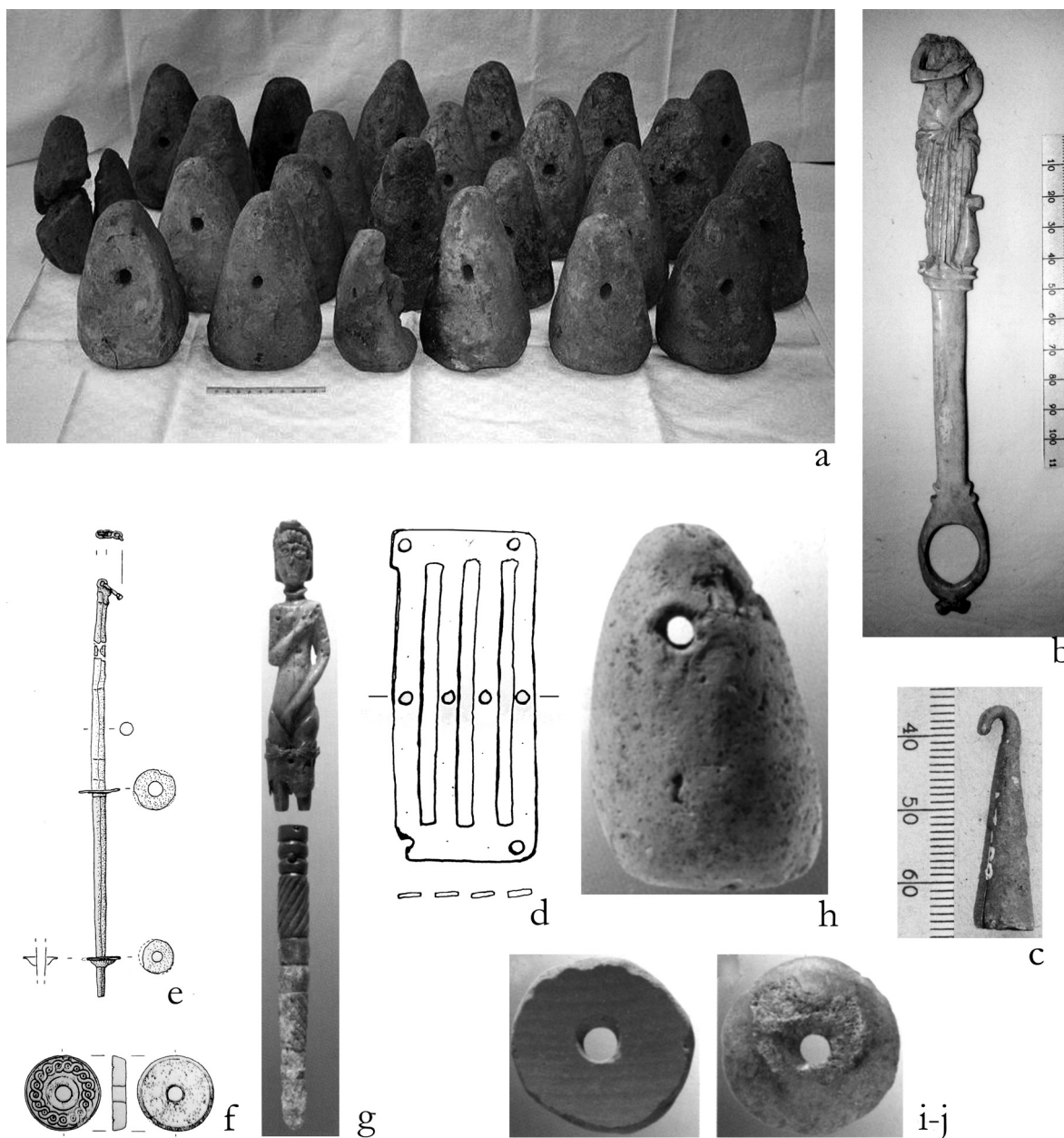


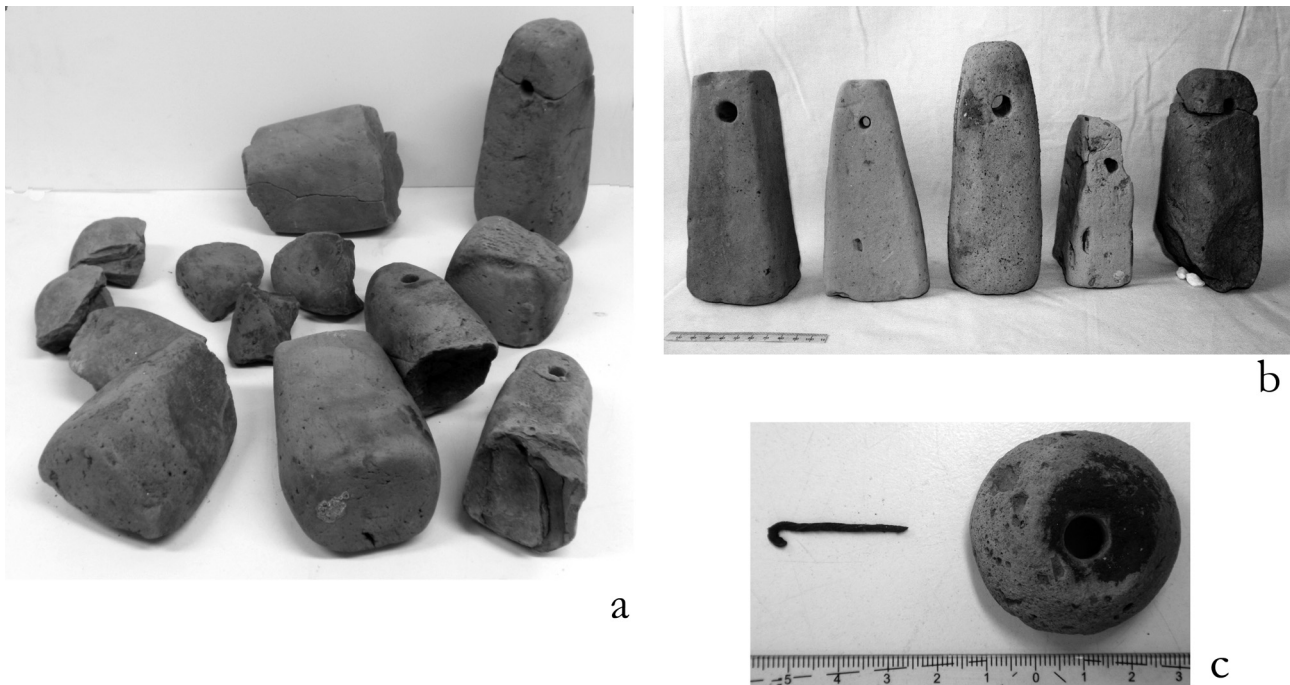
Fig. 2.9. Lauriacum: a loom weights; b Venus distaffs; c hook (CRAFTS Noricum, K. Gostenčnik); d beddle (After Wieser 1999); Mauern: e-f bronze spindle and whorl (After Grömer 2003, Fig. 47a-b); Aelium Cetium: g Venus distaff; h loom weight; i-j whorls (After Jilek et al. 2005, Figs 118, 128–129, 131).

and loom weights (Figs 2.9h–j) as well as bronze and iron needles are reported (Jilek et al. 2005, 37–38 and 70–71; Martijnse 1993, Nos 1–6). The loom weights, heavy pieces weighing 1.4 kg (Fig. 2.9h), were recovered from the layers dated to the 4th century AD (Jilek et al. 2005, 37, Nos 117, 119–120), attesting that the warp-weighted loom was still common in Roman Austria during this late period.⁷

Carnuntum/Petronell

One of the largest cities of Pannonia, Carnuntum (1st–4th/5th centuries AD)

housed a legionary fortress with its self-governing communities of non-Roman citizens (*canabae*), an auxiliary fortress with its civilian settlement (*vicus*), the autonomous town and capital of the province itself with the status of *colonia*, sacred complexes and theatres of extensive dimensions (cf. summary in Kandler 2004). Data on textile tools are, however, very few. At present it is impossible to estimate the actual scale of the town's textile production. Published finds (A. Rauchenwald in Jobst 1992, 399–401) include a bone needle-case containing two bronze needles and two hooks with twisted



shanks. The latter are rare examples outside southern Noricum. Some of the 20 lead *tesserae*, recorded up to 1993 (Martijnse 1993, Nos 107–126; their number has meanwhile increased) refer to finishing establishments in Carnuntum, although no fullery has yet been found. It would be interesting to learn whether differences exist between the textile-making equipment from the autonomous town and those from the civilian quarters outside the military fortresses. Regrettably, the most recent excavation reports focus on selected contexts and no data concerning textile production can be gleaned from them.

Textile Tools from the villae

Spindle whorls and loom weights are reported from *villae rusticae* all over Austria. As centres of agriculture, sheep rearing and flax cultivation, textile production occupied an important position in the economy of the *villae*. To what extent this signifies production for domestic use or for textile trade is unclear. In the case of the *villae* and, especially, of the smaller farmsteads, seasonal rather than year-round textile production is most likely. One particular model for rural production derives from the scenes on the 3rd-century AD pillar of the Secundinii at Igel in Germany, where older men, possibly tenants, bring textiles to be checked for their quality, followed by a payment

scene (Schwinden 1989; Wild 2002, 28). John Peter Wild concludes that the Secundinii were not involved in large-scale textile trade, but rather were landowners who used extra working capacity in the less labour intensive seasons to produce and process wool from their own flocks (but see Möller Wiering and Subbert in this volume).

While textile tools are regular finds in the *villae*, these sites are not well known archaeologically. In the hypocaust of a Roman *villa* at Grafendorf on the territory of Flavia Solva, 22 loom weights were found, dating to the turn of the 3rd century AD (Führholzer 1996). In the *villa* at Schönering on the territory of Ovilavis, loom weights were excavated in the topsoil layer of a building (early 2nd to the end of the 4th century AD) previously used as baths (Engemann 2000). It is possible that the baths were abandoned and the complex was reused as a workshop for weaving (Fig. 2.10b). Within structures interpreted as a *villa* at St. Agatha to the north of Virunum, a set of ten weights arranged in a circle was unearthed (Jantsch 1931, 17). In the course of rescue excavations in the Roman *villa* at Srejach to the south of Virunum, 20 loom weights weighing approximately 1 kg each were found scattered over several pits of the late 3rd century AD; four spindle whorls and one hook were also found (Fig. 2.10a and c). As the pits contained

Fig. 2.10. Srejach: a loom weights (Photo: K. Gostenčnik); b loom weights (Photo: K. Gostenčnik); c hook and whorl (Photo: CRAFTS Noricum, K. Gostenčnik); Schönering.

finds from the mid-1st to late 3rd centuries AD within the same context, a more precise dating is not possible. The weights possibly derive from a single loom, because they are quite uniform.

Textile Tools from Graves

In female graves, textile tools hold a dominant position, and are of highly symbolic significance (Cremer 1996; Rottloff 2006, 175–176; cf. also Gostenčnik 2005a, 223–246). However, this does not by any means suggest that these burials are of women who had earned their living through textile production, as the prestigious raw materials of the textile tools, such as amber, glass, jet, ivory, *etc.* are first and foremost indicators of a higher social level. Furthermore, these types of implements figure also among the items of the *mundus muliebris* depicted on tomb reliefs of women, among others in Italy, Asia Minor and elsewhere (Gostenčnik 2005a, 223–246; 2007). Therefore, it is essential to take special notice of the raw materials of grave finds and to consider the complete contexts of the graves, when interpreting the social status of the owner, and forming conclusions on whether the deceased earned her living by spinning or had domestic staff to do this job for her.

Bone distaffs and ring-distaffs in bone and glass, like the examples from Old Virunum/Magdalensberg (Figs 2.3a–d and 2.4a) are the most prominent objects in female graves of the 1st century BC (or even earlier) to the 2nd century AD in Roman Italy, as well as in the provinces.⁸ Besides the examples from Magdalensberg (Gostenčnik 2005a, Fig. 52.5), two bone ring-distaffs terminating at one end in a *Venus pudica* from Lauriacum and Aelium Cetium (Fig. 2.9b and g) come from Late Roman graves (Kloiber 1962, Pl. 29, Grab 84, No. 2; Jilek *et al* 2005, 36, No. 131). Late Roman distaffs terminating with a Venus figurine are known throughout the Roman world (Cremer 1996; Trinkl 2002; 2004; see also Pásztókai-Szeőke 2009). Generally, however, distaffs are rare in Roman graves in Austria and it is likely that many of these tools were made from wood or other perishable materials.

Spindle whorls are dominant tools in female graves of Late Antiquity. On Frauenberg near Flavia Solva (mid-4th to mid-5th centuries AD), 12 graves were equipped with spindle whorls (Steinklauber 2002, 172–174, Fig. 236),

and in five graves, hooks with twisted shanks were found (Steinklauber 2002, 149, Fig. 212; one such hook was found in a male cremation grave!). As some of the people buried on Frauenberg were members of Germanic tribes bound to Rome by treaty (*foederati*), the hooks could have been re-introduced from eastern Europe in this late period (Gostenčnik 2003), as they are well attested in Early Roman contexts in southern Noricum but have not been dated any later than the 2nd century AD.⁹ During the Migration period, however, this type of implement starts to spread with the movements of Germanic peoples. It is well attested (although not always identified as a spinning implement) in several graves in Europe to the north of the Alps (Articus 1997, 173–179), and in the south of Noricum (besides Frauenberg also in the 5th–6th century AD on Hemmaberg; for the latter see Gostenčnik 2003, 10). A late Roman bronze distaff and whorls (Fig. 2.9e–f) were found in a grave at Favianis (Grömer 2003). One or two loom weights in a grave might be seen as *pars pro toto*, but such finds are exceptional (Puhm and Tiefengraber 2007).

No funerary relief from Roman Austria has yet been found depicting spinning implements in the hands of the deceased women, despite the fact that such reliefs are known from the parts of Pannonia lying outside Austria (Pásztókai-Szeőke forthcoming). Men, too, only rarely hold tools in their hands on tombstones. Three blacksmiths with tongs from the territory of Flavia Solva are rare exceptions to the rule (Hudeczek 2004). Nor were the professions of the artisans mentioned in their tomb inscriptions, and graves equipped with tools and implements in general are exceptional. The reasons behind this obvious lack have not been discussed yet.

Written Sources

Tesserae plumbeae

Lead labels or *tesserae plumbeae*, which have been found all over Austria, are an important source of evidence for textile production, even if only some of them are actually connected to the textile business (Egger 1961–63; 1967; Römer-Martijnse 1990; Martijnse 1993). These written sources have been studied exhaustively by E. Martijnse (1993; see summary in Gostenčnik 2005b). These labels, about 2–5 cm long and 1–2 cm wide, bear graffiti naming the

personnel and clients of fulleries; provide names and prices of garments, wages in the textile business; quote colours, chemicals, and other relevant information. Most of the graffiti are abbreviated, but there are also sporadic examples of complete words.

The chronology of the labels is, however, problematic. Thus, the Kalsdorf hoard was dated to about the mid-2nd century AD based on onomastic evidence (Martijnse 1993, 364). This hoard consists of 201 labels, 130 of which are inscribed (Römer-Martijnse 1990). The obverse gives names of the workshop staff and/or the customers, while the reverse sometimes provides information related to textile production. Nine labels bear the word *fullo*, 'fuller'. The abbreviations *RVC* and *RVNCVM* are visible on 46 labels (Fig. 2.11ai). The root of these letters seems to be the word *runcare*, 'to pluck out' or 'to weed' (Römer-Martijnse 1990, 216–217), which may be connected to the finishing of textiles, i.e. to napping the surface before cropping it. Seventeen labels are inscribed with *LEVO* (Fig. 11aii), suggesting the word *levare*, 'to smooth' or 'to polish' (Römer-Martijnse 1990, 217), perhaps by means of a wool-press or even a linen rubber. Frequent abbreviations are *PVR*, *MOR* and *MVRIN*, referring to colours like *purpur* 'purple', *morus*, *morinum* 'black mulberry tree' or *morulus* 'deep black' (Römer-Martijnse 1990, 217; Martijnse 1993, 365). The orthography on the labels is often based on colloquial Latin.

Other abbreviations on the Kalsdorf labels name garments: *CAS* and *PAS* or *PAE* (Figs 2.11bii–2.11cii) for the accusative of *casulas* and *paenulas* and the nominative *paenulae* (Römer-Martijnse 1990, 217–218). A label from Brigantium/Bregenz in Raetia reads *PAENVLAE* (Egger 1961–63; Römer-Martijnse 1990, 218). An abbreviation for *mantus* or *mantellum* has been suggested for the single letter *M* (Egger 1961–63; Römer-Martijnse 1990, 218). The words *FVLLO* (Fig. 2.11bi) and *SVLP(h)VR* are combined on one Kalsdorf *tessera* (Römer-Martijnse 1990, 218). *SVL* for 'sulphur' is twice mentioned on *tesserae* from Flavia Solva. *COCILLARE* instead of the classical Latin word *conchyliare* 'to dye purple' is recorded at Carnuntum (Martijnse 1993, 368). A label from Virunum reads *MORINVM* (Martijnse 1993, 88–106, No. 89). Several bear *P* or *PO* either for *pes* 'foot' or *pondo*

'pound', combined with numbers (Fig. 2.11cii), indicating the length or weight of a cloth or garment (Römer-Martijnse 1990, 218–219).

In Flavia Solva and Carnuntum, the word *SAR*, most likely for *sarcire*, refers to the mending of a garment (Martijnse 1993, 363). One of the *tesserae* from Flavia Solva has *SAR* and *PAS* on its reverse – *sarcire paenulas*. The letters *ISP*, *ISPRE* and *ISPAVE* from Virunum/Zollfeld and Flavia Solva are interpreted as *(h)ISP(ida)RE*, 'to nap' (Martijnse 1993, 363–364). On one label from Virunum, this word is connected with *fullo*. The word *PVRPVR* appears fully written at Zillingdorf on the territory of Carnuntum. Another garment, *banata*, is found on labels from several different sites, while *velum* is attested for Carnuntum (Martijnse 1993, 367–368). The word *vellimnum*, a synonym for *vellum* 'fleece', is suggested for *VELINVM* (Martijnse 1993, 368, with reference to Varro, *De re rustica* 2.11.9.). Finally, prices in *denarii* (X) and *sestertii* (HS) for different tasks and for garments are present on several *tesserae*.

Five published *tesserae* from Old Virunum/Magdalensberg (Egger 1967, 195–202; Martijnse 1993, 289–297) reveal further details, and chronologically these finds appear to be the oldest in Roman Austria. Payment in gold coins (*aurei*) is mentioned on two of the Magdalensberg labels. The obverse reads: *PAE(nulae) III / X VI HS I [sut]ORI – 3 paenulae, 6 denarii (= 2 denarii each), 1 sestertius* for the *sutor*; reverse: *NOVAE X / A(ureum) I EXC(isori) – 10 new (paenulae), 1 aureus* for the *excisor* (1 *aureus* = 25 *denarii* = 2.5 *denarii* or 10 *sestertii* for one single *paenula*). The low price for the *sutor* most likely indicates mending the *paenulae*, whereas the *excisor* receives payment for making ten new items (Egger 1967, 200, No. 3; Martijnse 1993, 291–293). The other label (Fig. 2.6b) reads on the reverse *SAGA VLKISLA / NA [s]VTOR(i) / EXCIS(ori) / AVR(eum) X V VNVNVM*, interpreted as '10 *saga ulksiana*,¹⁰ 1 *aureus* for the *excisor*, 5 *sestertii* for the *sutor* (= ½ *denarius* or 2 *sestertii* for one single *sagum*)'. On a third example from Magdalensberg (Fig. 2.6d) coloured garments are listed: *LOYTEI M(antus) III / X VI HS II SVTORI – 3 saffron-coloured mantles, 6 denarii (= 2 denarii each), 2 sestertii* for the *sutor*.

Another *tessera* (Fig. 2.6c) possibly sheds light upon the textile trade between Magdalensberg and Padua in north-eastern Italy (Egger 1967,

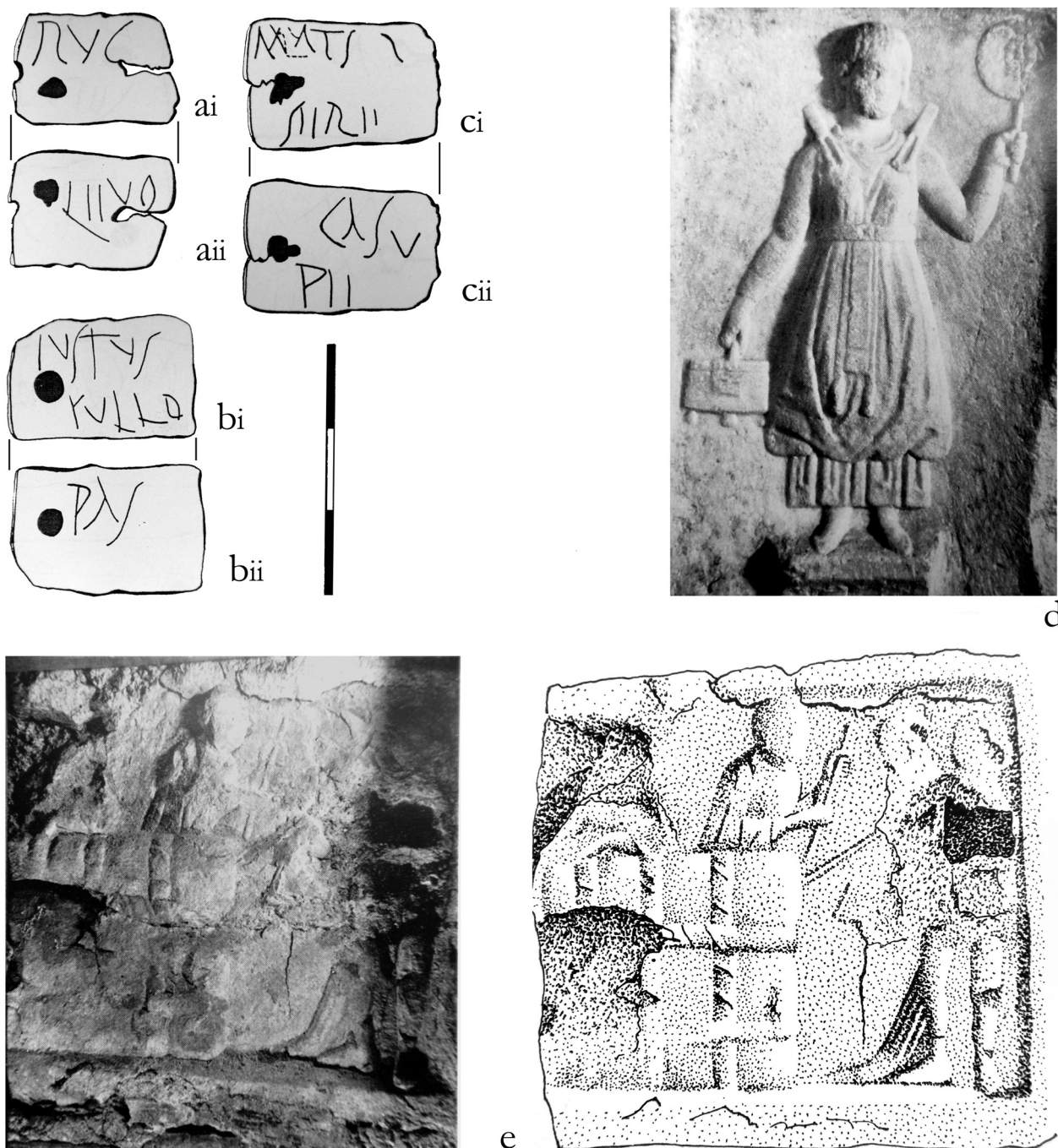
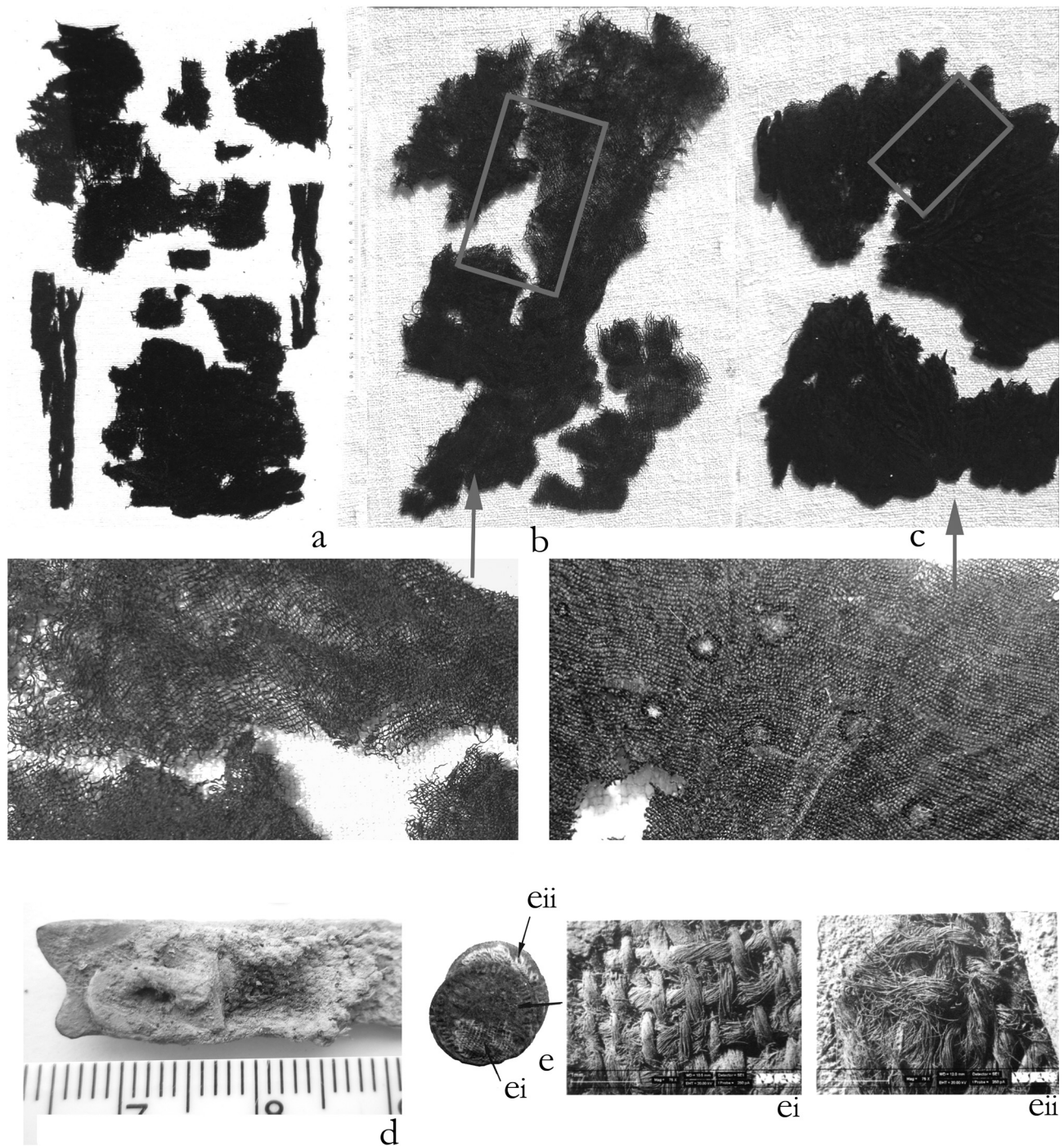


Fig. 2.11. Kalsdorf: a–c lead tesserae (After Römer-Martijnse 1990, Nos 5, 88, 92); Virunum: d tomb relief, girl in traditional costume (After Piccottini 1977, Pl. 8.198); Iuvavum: e relief (After Heger 1975, Pl. 22.52).

197–199; Martijnse 1993, 290–291; and especially Bonetto 2001).¹¹ On the obverse, the names *Liccaia et Trauseus* are visible, interpreted as business partners; the reverse has another word for a wool garment or mantle, *gausapum*, which according to literary sources is the most renowned product of Padua's textile industry in antiquity (Bonetto 2001, 158). The name Liccaia is attested in Noricum, Gallia Cisalpina as well as in Aquileia in northern

Italy. The name Trauseus, besides being present in Noricum or Aquileia, is most familiar among the Latin inscriptions of Venetia and also in Padua. On this basis, Jacopo Bonetto suggested the existence of a textile trade with Padua or even a fullery run by immigrants from Padua settling on Magdalensberg (Bonetto 2001, 159–161). Branch offices on Magdalensberg founded by textile merchants or producers from north-eastern Italy were necessary to



control the output of those employed in the textile business. As Magdalensberg was an *emporium* of merchants from Italy with a well-developed stock exchange, it is not unlikely that the textiles made on Magdalensberg were primarily meant for the markets in Italy.¹²

Literary Sources

Diocletian's Price Edict (§ 19, ed. Lauffer 1971)

quotes different wool garments from Noricum, allowing us to conclude that these were of high quality, much sought after and thus exported (Martijnse 1993). Besides *mantus* and *paenula*, which are not explicitly called Norican, the following are specified: *burrus Noricus* $\times$ *decem milibus*; *banata Norica duplex* $\times$ *viginti milibus*; *fedox Noricus optimus* $\times$ *decem milibus*; *singilio Noricus* $\times$ *mille quingentis*. One mantle is also

Fig. 2.12. Roman textiles from Austria: a–c Magdalensberg (After Gostenčnik 2010, Fig. 14.16); d Oberdrauburg (Photo: K. Gostenčnik); e Deutschkreutz (After Grömer 2007, Fig. 1).

listed among the prices for fulling (§ 22, ed. Lauffer 1971): *in byrro Norico X ducentos*. Some of these garments, obviously mantles, are also known from the lead labels (Martijnse 1993, 370). The *Exposition totius mundi et gentium* 57, dated to the 4th century BC, attests to textile exports from Noricum, as it reads: *Noricum, unde vestis Norica exire dicitur* ("Noricum, where the Norican garments are said to originate from"). Considering the prices for textiles on the Magdalensberg lead *tesserae* and those from the Diocletian's Price Edict, the enormous inflation during 300 years is clearly revealed.

Iconographic Sources

Relevant iconographic sources are extremely rare in Roman Austria. As noted above, funerary reliefs do not depict textile tools, in contrast to those from other Roman provinces, such as Pannonia and Gaul (see *CSIR Österreich, passim*). A marble relief of unknown origin immured in a church at Iuvavum/Salzburg and dated to the 2nd/3rd century AD (Heger 1975, 33, No. 52 and Pl. 22.52), represents the tying up of cloth or garments (Fig. 2.11e), similar to the relief on the Igel monument (*cf.* Möller Wiering and Subbert in this volume). The interpretation proposed for Igel (see above) might also be considered for textile production in this region and several others in Roman Austria.

Textiles

As mentioned in the introduction, relatively few textiles from Roman Austria have been published to date. Nevertheless, they allow some remarks concerning the techniques of spinning and weaving or the thread counts of Roman fabrics, even if warp and weft are not always identifiable. Chronologically, the fragments span the period from the second half of the 1st century BC to the 5th/6th centuries AD. Textiles from the 1st–2nd centuries AD are rare, which is primarily due to the custom of cremation (Karina Grömer, pers. comm.). Recently, new finds have been noted on metal artefacts, especially on finds from Late Antique burials, when inhumation became common.

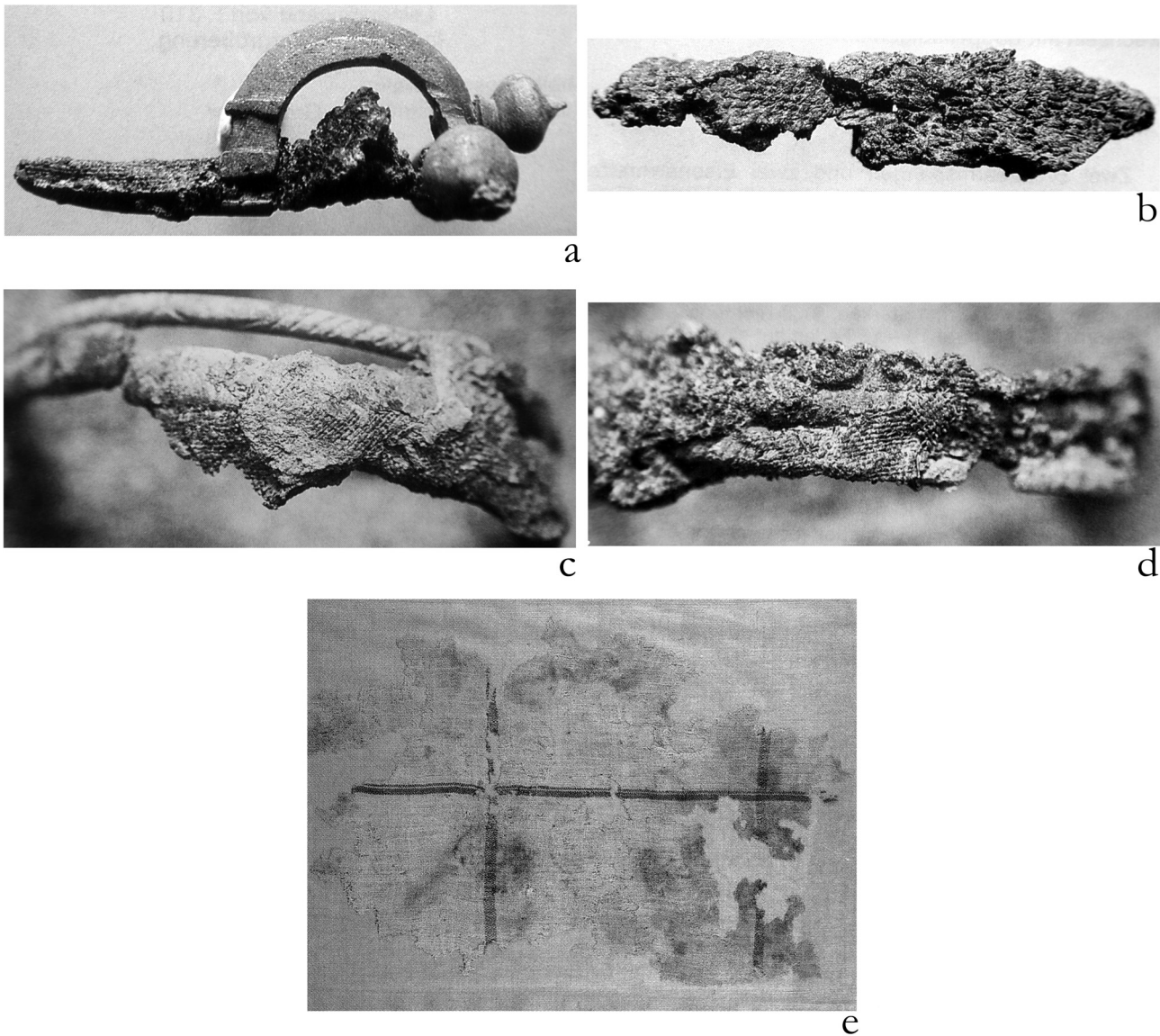
At Magdalensberg, three different groups of textiles, all linen and carbonised (Wächter 1986), were used as corn containers (Fig.

2.12a–c). They have been recently analysed (Grömer 2009). The first group consists of tabbies (Fig. 2.12a) made of S2z-ply yarn measuring 0.3–0.4 mm in diameter in both systems with 10/9–10 threads/cm. The selvage is reinforced, woven in a rep tabby with 24–30/9–10 threads/cm. The open tabby of the second group (Fig. 2.12b) is made of s/s-twisted yarn of 0.2–0.3/0.1–0.2 mm thickness and has 9/8–9 threads/cm; this textile most probably was originally a veil. Tabby textiles belonging to the last group (Fig. 2.12c) are woven in S2z-ply yarn and have 14–16/18–20 threads/cm, being slightly denser near the border.

The rep band (2.4 × 0.8 cm) excavated in Oberdrauburg to the east of Aguntum is riveted onto a rectangular bronze mount and is discoloured green by the bronze corrosion (Fig. 2.12d; Grömer and Gostenčnik 2009). It was recovered in the topsoil and cannot be dated more precisely than the 1st century BC–3rd century AD. It is made of plant fibre, probably flax. The thread count is 28/10, and the diameters of the S2z/z-twisted threads are 0.5–0.6/0.4 mm. The bronze fitting indicates that the band served the vertical strap hanging from a belt, typically worn by women in Noricum and Pannonia (Fig. 2.11d). The fragment proves that such belts were made not only of leather as is usually assumed but also from textiles.

A coin hoard from the district of Deutschkreutz in eastern Austria was originally wrapped in a piece of cloth or put into a pouch and deposited within a pottery vessel (Grömer 2007). Minute textile remains were preserved adhering to coins (Figs 2.12e). The textile, made from linen, is woven in rep tabby from s-twisted yarn of 0.2–0.3/0.1 mm and has a thread count of 17/>35. Its warp and weft direction cannot be determined. The most recent coin of this hoard is dated to AD 268.

A variety of metal artefacts, from 4th–5th century AD graves from Frauenberg on the territory of Flavia Solva, yielded data for 13 textiles (Fig. 2.13a–d; Grollegger 2002; detailed analysis in preparation by Karina Grömer). Most of these are tabbies of varying qualities (yarn diameter 0.1–0.8 mm), with thread counts ranging from 8 to 20 threads/cm. On a crossbow onion-head fibula (*Zwiebelknopffibula*) in a copper-alloy (Fig. 2.13a), fragments of two different textiles are preserved (Grollegger



2002, 409, No. 96/5370, figs 1–2). One is probably a 2/2 twill, possibly of wool, in z/z twist, with an indeterminable thread count. The second is a dense cloth in tabby with z-twisted threads of 0.2 mm in diameter, counting 16–18 threads/cm. An iron bracelet (Fig. 2.13b) also has two different textiles preserved (Grollegger 2002, 409, No. 96/5667B, Fig. 3). One is made from 0.2 mm thick z/z-twisted threads, counting 9–10 threads/cm in warp and weft. The second is a half-basket weave made of linen and was identified as the hem of a sleeve. It was made from 0.2/0.3 mm thick yarn with a thread count of 15–16/7 threads/cm (the spinning direction is not specified). Bracelets in copper-alloy and iron (Fig. 2.13c–d) had

leather and textile fragments preserved on them (Grollegger 2002, 410, No. 95/9079/2–5, Figs 4–8). Of the latter, textile No. 1, a dense tabby, was made from 0.3 mm thick z-twisted linen threads counting 18–21/16 threads/cm, while No. 2, also a tabby, was made from 0.2–0.3 mm thick z-twisted yarn with a count of 20 threads/cm.

A reliquary shroud from Lauriacum (Fig. 2.13e) was found in an ossuary containing the bones of martyrs. The ossuary is a Roman urn measuring 0.75×0.75 m, and according to the chronology of the excavations in the church, it was deposited during the mid-5th century AD (Harreither 2004, 37 and n. 29, with references; also Ubl 1997, 223, No. IV/S-1). It has thus far

Fig. 2.13. Late Antique textiles from Austria: a–d Frauenberg (After Grollegger 2002, Figs 2–4.6; e Lauriacum (After Harreither 2004, 37).

not been radiocarbon dated and the date is still disputed. Its fabric is composed of wool and linen with blue stripes in both systems.

While the original colours of the surviving textile fragments are for the most part unknown, we know that many textiles were dyed, since at least some colours are mentioned on the lead *tesserae*.

A stone casting mould for bronze fittings from Magdalensberg bears the inscription ICCO EP(h)IPPIARI(us) (Egger 1967, 202–204). The word *ephippiarius* is interpreted as producer of horse blankets, but whether the fittings were mounted onto such blankets on Magdalensberg, or whether they were exported like other bronze goods, is impossible to ascertain. Such thick textiles (rather than leather) might also have been among the merchandise produced by the *centonarii*.

Conclusions

In the Roman period, the economy is more complex than in the preceding Iron Age. Numerous merchants and guilds throughout the Roman Empire were engaged in local and long-distance textile trade, as proven by literary and epigraphic sources. In Austria, a *collegium centonariorum* is attested for Flavia Solva from the beginning of the 3rd century AD.

Besides Old Virunum/Magdalensberg and Flavia Solva, other centres of commercial textile production are hard to ascertain. The distribution of tools on Magdalensberg refers to production organised on a household level by textile companies probably employing several inhabitants of the town by means of contracts. Warm garments from wool are a vital necessity in Central Europe. Fulling is a technique to produce warm and water-resistant cloth and was already practised in the eastern Alps in prehistoric times (*cf.* Grömer in this volume). Although lead labels suggest the presence of fulleries in every Roman town in Austria, only one structure has hitherto been identified as such in Virunum.

Textile tools found in graves do not necessarily indicate that the deceased earned her living in the textile business. When they are made from precious raw materials, the tools are primarily prestige objects, loaded with symbolism. Graves have also yielded almost all the textiles preserved from the Roman period in Austria. Most of them are tiny fragments

of fine quality, with thread counts of up to 20 threads/cm. Plain tabbies dominate, but examples of twill, half-basket weave and one tablet weave are also extant.

Research on textile production in Roman Austria is still in its infancy. This is due to the fact that textiles are rare compared to other archaeological materials, and the enormous economic power of the textile business is therefore highly underestimated. It is hoped that more focus on the textile craft and handicrafts in general in current archaeological research (*cf.* the contributions in Amrein *et al.* 2008) will improve our understanding of this complex part of the economy.

Acknowledgements

I wish to thank Margarita Gleba (London) for inviting me to contribute this chapter and for correcting my text, and Karina Grömer (Wien) for several most productive discussions.

Notes

- 1 For Roman Austria in general, see Betz and Weber 1990 and Gassner *et al.* 2002, the latter with extensive bibliography. Noricum is discussed in Alföldy 1974; Fischer 2002; *RG4² s.v.* Noricum (H. Ubl); see also Šašel Kos and Scherrer 2002 on the autonomous towns of the province, and Wedenig 1997 on the evidence of administration. For Pannonia superior, see Mocsy 1974, and on the autonomous towns, Šašel Kos and Scherrer 2004. On the Austrian part of Raetia, see Gassner *et al.* 2002, *passim*, and the contributions in Walde 1998, or Schimmer 2005.
- 2 Apart from the sites in Noricum surveyed below, textile tools from the autonomous towns of Teurnia (St. Peter in Holz), Aguntum/ Dölsach, Iuvavum/ Salzburg and Ovilavis/ Wels are too few to form the basis of analysis and therefore omitted, although a small number of whorls, loom weights, needles or distaffs are on display at the local museums (see Šašel Kos and Scherrer 2002). Lead *tesserae* are now also reported for most of these sites (R. Wedenig, pers. comm.), which is by no means unusual considering their urban infrastructure, although they were unknown in those places in the early 1990s (*cf.* Martijnse 1993, *passim*). However, it must be kept in mind that these labels are not exclusively related to textile production. The legionary fortress of Vindobona/Wien in Pannonia and its surrounding civilian areas are omitted from this survey as data for textile tools are not available; *cf.* Mader 2004.

- 3 As summaries of the Magdalensberg textile tools are already published elsewhere, the present chapter gives an overview only; for details and references *cf.* Gostenčnik 2009 and 2010. The complete Magdalensberg bibliography is available at <http://www.landmuseum-ktn.at/Landesmuseen/Magdalensberg/Magdalensberg-Bibliographie-20101221.pdf>.
- 4 *Cf.* bibliography in Bonetto 2001, Cottica 2003 and Buonopane 2003; inscriptions preserved in northern Italy and referring to textile *collegia* as well as to *vestiarii*, *mercatores vestiarii* or *negotiatores vestiarii* are now amply discussed in Liu 2009 and Liu forthcoming.
- 5 But *cf.* Chiabà 2003 on members of the *gens Trosia* (also *Trausea* and *Trausia*) in north-eastern Italy and their activities as workers in the textile business; see also Bonetto 2001 on the *Trausii* and connections with Magdalensberg.
- 6 This spindle type, although rare, is present in the archaeological record of sites quite far apart; see *e.g.* Deschler-Erb 1998, Pl. 13,345 (bone) from Augst in Switzerland; Pinelli and Wąsowicz 1986, 179 No. 94, from Kertch in Ukraine (wood); Alessio and D'Amicis 1987, Pl. 35.13, 36 (bone) from Taranto in Italy.
- 7 See *contra*, the discussion of the loom types in Roman Britain in Wild 2002, 10.
- 8 Several examples come from Aquileia (Giovannini *et al.* 1998, Pl. 4 and 8); a distaff and ring distaff were found in a rich grave of a young girl in Rome (Platz-Horster 1979, 189, Figs 277–278); other items are known from Taranto in southern Italy (Alessio and D'Amicis 1987, Pl. 40, 43 and 106) and from Emona in Slovenia (Plesničar Gec 1972, *passim*).
- 9 According to the late E. Hudeczek (pers. comm.), the archaeological context of the hooks from Flavia Solva underscores this dating.
- 10 This mantle type was either imported from Ulkisiana Castra/Szentendre located to the north of Budapest, or its name refers to a special shape, *cf.* Egger 1967, 202.
- 11 The complete text (Fig. 2.6c) reads: obverse *LICCALAET / TRAVSEVS / [---] ANAEVS*; reverse *GAVSAPA VIII / M / X X / HS I (libellas) / SVTORI VNVM* – Liccaia and Trauseus [---]anaeus; 8 *gausapa m(antus)*, 10 *denarii* (= 1 *denarius* and 1 *sestertius* each), 1.5 *sestertii* for the *sutor* for one (*gausapum*).
- 12 Miko Flohr in a personal comment suggested that fulling and finishing of the textiles produced on Magdalensberg could well have been undertaken in one of the textile centres in Italy, as large-scale enterprises there were equipped with the *fullonicae* sufficiently large to handle enormous quantities of unprocessed garments. Thus, the business run by Liccaia

and Trauseus might also be considered in this respect. Altinum, one of the central wool markets in north-east Italy, yielded a number of inscriptions which are related to the textile business (Buonopane 2003). *Cf.* especially Liu 2009.

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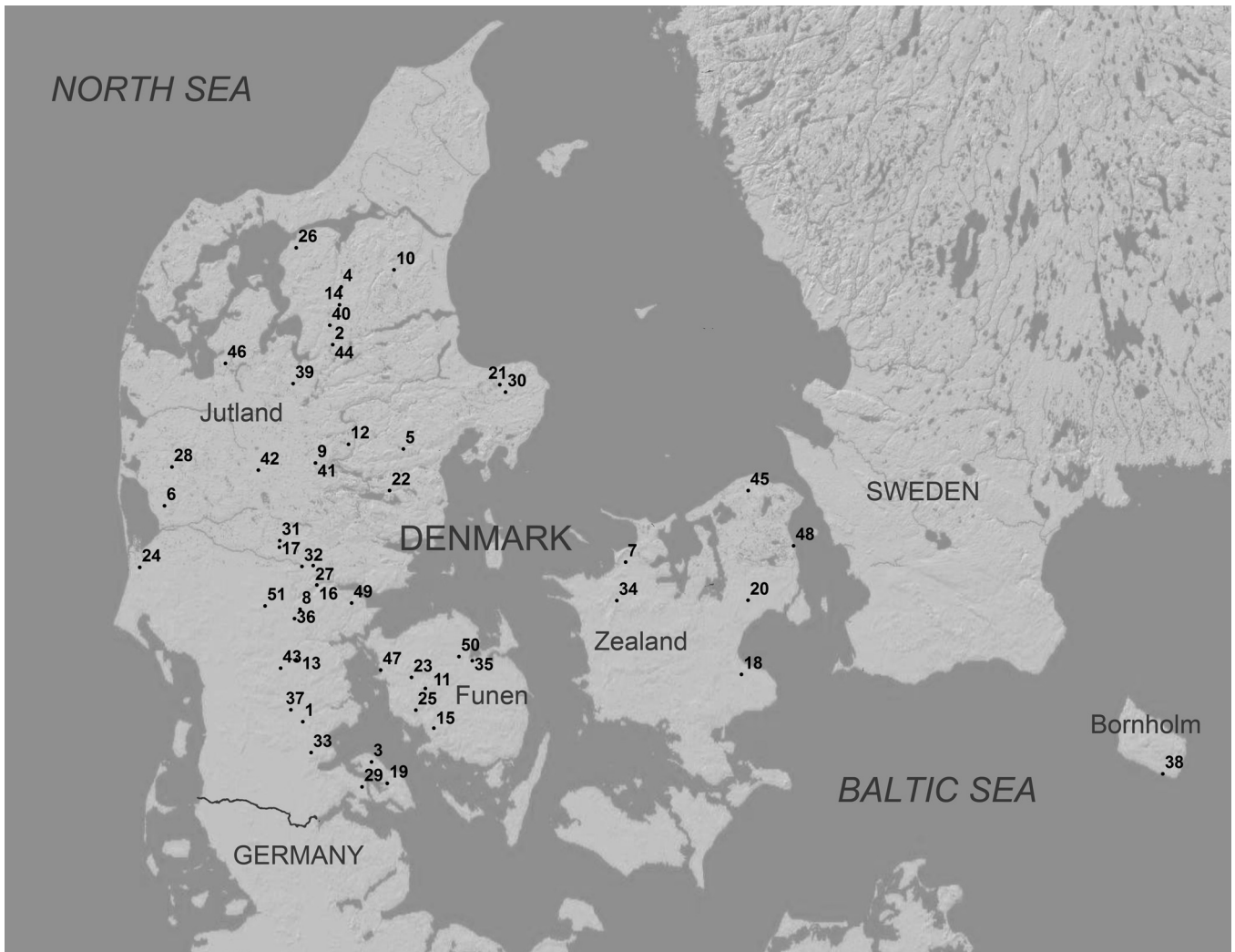
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DENMARK

Mesolithic period	12500–3900 BC
Neolithic period	3900–1800 BC
Bronze Age	1800–1100 BC
Late Bronze Age	1100–500 BC
Early Iron Age	500 BC–AD 400
Pre-Roman Iron Age	500 BC–1 BC
Roman Iron Age	AD 1–400
Migration period	AD 400–570

DENMARK



Map 3.1. Denmark. Sites mentioned in Chapter 3:

1 Arnitlund	14 Gundestrup	27 Møgelmosse	40 Thorup
2 Baunsø	15 Haastrup	28 Muldbjerg	41 Tollund
3 Bolkilde	16 Haraldskær	29 Nydam	42 Tornebuskehøj
4 Borremose	17 Hedegård	30 Ørbækgård	43 Trindhøj
5 Borum Eshøj	18 Himlingøje	31 Oksenbjerg	44 True Mose
6 Dejbjerg	19 Hjortspring	32 Refstrup	45 Tulstrup
7 Dragsholm	20 Høje Tåstrup	33 Rischjarup	46 Tværmose
8 Egtved	21 Huldremose	34 Ryemarksgård	47 Tybrind Vig
9 Elling	22 Illerup Ådal	35 Seden	48 Vedbæk
10 Fræer	23 Lindebjerg	36 Skærsø	49 Vilstrupgård
11 Frydenlund	24 Lønne Hede	37 Skrydstrup	50 Vimose
12 Grauballe	25 Lusehøj	38 Slusegård	51 Vorbasse
13 Guldhøj	26 Melhøj	39 Søgård	

Denmark

Ulla Mannering, Margarita Gleba and Marianne Bloch Hansen

Introduction

Denmark possesses one of the largest collections of complete prehistoric textiles in the world. This is due to the unique preservation conditions encountered in the Bronze Age burial mounds and in peat bogs where Early Iron Age skin and textiles have been discovered. The majority of these finds were recovered in the 19th and early 20th centuries during farm work, peat cutting or construction work.

Especially on the Jutland peninsula where the unique environment in raised bogs preserves proteinaceous materials, an impressive group of human remains with soft tissues and hair, textiles in wool and animal skin and leather objects have been preserved almost intact. Many of these finds were unearthed before 1900 and all before 1953. They provide an outstanding contribution to our understanding of Scandinavian and European prehistoric textile and costume development and form the basis of a long tradition for textile research in the Scandinavian countries.

Chronological and Cultural Background

Denmark belongs to the Scandinavian cultural

area. The present Danish territory comprises the elongated Jutland peninsula, which is linked to the European mainland bordering northern Germany, and numerous islands. The largest of these islands, Zealand, measures approximately 100 km from east to west. The second largest island is Funen. This landscape is dominated by fertile hilly lowlands with numerous peat bogs, small but navigable rivers and fjords. In contrast, the northern part of Scandinavia comprising modern Norway and central and northern Sweden is dominated by extensive forests and mountains (*cf.* Franzen *et al.*, Halvorsen in this volume). Life in southern Scandinavia has always been conditioned by, and to a large extent dependent on, the ever near coastline. The sea and the rivers were important routes of communication creating connections between areas and peoples.

Danish prehistory is generally characterised by small-scale societies initially dependant on fishing and hunting, and later, on agriculture (Kristiansen 1985). The Danish Stone Age covers the Palaeolithic and Mesolithic periods from c. 12500 to 3900 BC and the Neolithic from c. 3900 to 1700 BC. Few skin and textile finds are known from these early periods.

The Danish Bronze Age spans from c. 1700 to 500 BC and is divided into six phases

according to the system of Oscar Montelius (1885). The Early Bronze Age covers the period of *c.* 1700–1100 BC, with Montelius phases I–III, and the Late Bronze Age spans from *c.* 1100 to 500 BC, divided into Montelius phases IV–VI. The Danish Bronze Age was dominated by relatively small settlements thriving on well-developed agriculture. An extensive network of exchange and trade routes across the European continent influenced local social structures and customs (Kaul 1998; Kristiansen 1998; Kristiansen and Larsson 2005; Bergerbrant 2007; 2010).

In the Early Bronze Age, inhumation graves dominated. The large burial mounds constructed for prominent members of society that are still visible throughout the Danish landscape have provided a very favourable environment for the preservation of the oak coffin graves and the organic material inside, such as wood, textiles and skins.

In the Late Bronze Age, cremation became the predominant burial custom in Denmark, often in the form of urns placed secondarily in the large burial mounds constructed during the Early Bronze Age. This is the primary reason why the textile material from this period is much more fragmentary.

The Danish Pre-Roman Iron Age covers the period from *c.* 500 BC to the Common Era and has traditionally been divided into three phases (Becker 1961). Today, however, the Pre-Roman Iron Age is most often split into two phases: an early period from *c.* 500 to 200 BC and a late period from *c.* 200 BC until the Common Era (Hedeager 1992, 6–8, Fig. 1.5; Martens 1997). As in the Late Bronze Age, the Pre-Roman Iron Age burial tradition was dominated by the custom of cremation. The main difference is that large burial mounds were no longer used and cemeteries appeared instead. The graves containing the cremated remains of the deceased could be marked by a small mound or with stone settings. Usually, only a few grave goods accompanied the dead, most frequently iron objects such as pins, fibulae, knives, shears and similar items. The majority of the graves have been found in southern and central Jutland, whereas very few are known from Zealand (Bender Jørgensen 1986, 294; Jensen 2003, 55–63).

The Pre-Roman Iron Age is also the period when the custom of depositing objects and bodies in the bogs was particularly prominent

(van der Sanden 1996; Fischer 2007; Asingh and Lynnerup 2007). Wet, acidic, low oxygen or completely anoxic conditions and the presence of polysaccharide sphagnum in the peat bogs (van der Sanden 1996, 18) have preserved a large number of textiles and skins (Hald 1980; Mannering and Gleba forthcoming). They provide an important record of Early Iron Age Danish textiles, skins and costumes made of these materials.

Until recently, the Pre-Roman Iron Age was seen as a period of economic and cultural decline in Denmark, but renewed focus on the material culture and especially the textile and skin finds from the bogs have provided new evidence for the understanding and interpretation of this period (Mannering and Gleba forthcoming). Imported luxury objects such as the Gundestrup cauldron demonstrate that wide ranging contacts existed, and in the 1st century BC objects of Roman origin begin to appear in the Danish archaeological material (Lund Hansen 1987; Kaul and Martens 1995; Kaul 1995; 2007; Martens 1997).

The Roman Iron Age in Denmark began around the Common Era and lasted until *c.* AD 400. It is divided into five phases, B1 and B2 belonging to the Early Roman Iron Age and C1, C2 and C3 comprising the Late Roman Iron Age (Lund Hansen 1995, 17–18, Fig. 1:4). During the Roman Iron Age, a new hierarchical and more centralised society evolved, and centres of power such as Himlingøje on Zealand were established (Hedeager 1992; Lund Hansen 1995).

In the Roman Iron Age, the inhumation burial custom reappears alongside the cremation custom in most areas covered by present-day Denmark. As a result, textile remains from this period are much more common, although they are not evenly distributed geographically. Textiles have been preserved on the island of Bornholm in the Baltic Sea, as well as in north and east Jutland. Only few textiles have been recorded from Zealand, although some of the richest graves of the Roman Iron Age have been found in this area. The main reason for the biased find record is probably the differences in soil conditions (Bender Jørgensen 1986, 29).

The practice of depositing weapons, and occasionally boats, in ponds and lakes of northern Europe became relatively common during the latter part of the Roman Iron Age, AD 1–400. Several of the largest and best known of

	Huldremose Type	Haraldskær Type	Virring Type	Spin-pattern Type
Stone Age –1700 BC				
Early Bronze Age 1700–1100 BC				
Late Bronze Age 1100–500 BC				
Pre-Roman Iron Age 500–1 BC				
Early Roman Iron Age AD 1–200				
Late Roman Iron Age AD 200–400				

Table 3.1. Chronology of the most important textile types as defined by Bender Jørgensen 1986.

such deposits have been excavated in Denmark: Illerup Ådal, Nydam and Vimose. Weapons and other objects were wrapped in textiles before deposition and often preserve mineralised traces of fabrics (Möller-Wiering 2011).

Textile type	Weave	Twist direction	Fibre
Huldremose	2/2 twill, balanced	s/s	Wool
Haraldskær	2/2 twill, balanced	z/z	Wool
Virring	2/2 twill, lozenge or diamond twill	z/s	Wool
Spin pattern	2/2 twill, balanced	e.g. 4s,4z/4s,4z	Wool

Research History

Margrethe Hald was the first Danish researcher to make collective and comparative studies of the Danish prehistoric textile finds. In collaboration with Hans Christian Broholm, she published the monograph on the Danish Bronze Age costumes from the oak coffin graves (Broholm and Hald 1935; English edition in 1940). In 1950, Hald published another seminal work on Danish Iron Age textiles and costumes, which was later translated into English (Hald 1980). The monograph contains a presentation of archaeological material from bogs and burials as well as chapters on textile technology, and it has been the primary reference on the extraordinarily well preserved Danish bog finds of textiles and skins. In 1974, Elisabeth Munksgaard published an overview on prehistoric Scandinavian costume with a brief presentation of many well-known finds.

Karen-Hanne Stærmosen Nielsen has contributed to Danish textile research with the analysis and reinterpretation of some of the Danish Bronze Age textiles and costumes focusing on tailoring and construction (Nielsen 1971). She proved that the wrap-around garment found in the Muldbjerg oak coffin grave was made from the same piece of fabric as the kidney-shaped cloak. The cut-away pieces left over when obtaining the latter were used to construct the wrap-around garment. The wrap-around garment of the Trindhøj Man was made in a similar manner, although not from the cloak found in the grave. She

has also investigated the Bronze Age textiles from Skrydstrup, Guldhøj, Melhøj and Egtved (Nielsen 1971; 1979; 1980a; 1980b; 1989; Alexandersen *et al.* 1981; Bender Jørgensen *et al.* 1982). Nielsen has also written about the history and use of the warp-weighted loom (Nielsen 1999).

Lise Bender Jørgensen's extensive research on Scandinavian (1980, 1986) and European (1992) textile material is the foundation of modern European textile research. Her seminal work, *Prehistoric Scandinavian Textiles* includes a catalogue of 95% of the Danish textile finds known at that time (Bender Jørgensen 1986). The textiles analysed come primarily from burial contexts and usually have been preserved in contact with metal objects. The bog textiles published by Hald (1950; 1980) were not included in the catalogue. Although textiles from burial contexts are often very fragmentary and are in a mineralised state, they form a large, statistically valuable and easily comparable body of evidence for textile studies, including information on the type of weave, twist, pattern repeat and thread count. Bender Jørgensen also further developed a system to categorise textile types started by Hald in 1950. The chronological occurrence of the most important textile types can be seen in Table 3.1, while the definitions of the types are given in Table 3.2. Analyses of colour and fibre have also been carried out (Bender Jørgensen and Walton 1986; Ryder 1988; Walton 1988; Mannering 1995).

Table 3.2. Definitions of the most important textile types as defined by Bender Jørgensen 1986.



Fig. 3.1. Incised human figures on an auroch bone from Ryemarksgård, Zealand, c. 8000 BC (Photo: National Museum of Denmark).

Since 2006, the finds from the Danish bogs and weapon deposits from Pre-Roman and Roman Iron Ages have been given renewed attention in an extensive research programme by the Danish National Research Foundation's Centre for Textile Research. Results on dating, dye tests, strontium analysis, visual quality and design of the Danish Early Iron Age costumes form the basis for an entirely new understanding of costume and costume design in Scandinavia throughout prehistory (Nørgård 2008; Frei *et al.* 2009a, 2009b; Mannering *et al.* 2010; Möller-Wiering 2010; 2011; Vanden Berghe *et al.* 2009; 2010; Gleba and Mannering 2010; Mannering and Gleba forthcoming). Thus, an important result of ^{14}C dating is that the majority of bog finds with well-preserved bodies and/or textiles, skin garments and shoes fall within the Pre-Roman Iron Age and the beginning of the Roman Iron Age, indicating that the practice of placing bodies in bogs and making bog sacrifices of textiles and skins as individual objects were phenomena particularly common in this period. The results of dye analyses clearly indicate that most Scandinavian peat bog textiles originally were dyed and that already during the 1st millennium BC, the populations in Scandinavia were familiar with dyeing technology. As a result of this new research, Danish bog finds constitute one of the best investigated corpora of textiles in Europe to date.¹

Stone Age

Due to the lack of direct evidence, our knowledge of Stone Age textiles is very limited. The costumes of the Stone Age hunters were probably made of animal skins and hides. A few representations of people in what are usually interpreted as fur or skin garments have been found in Denmark. The most famous of these is the image incised on an auroch bone

from Ryemarksgård, west Zealand, dated c. 8000 BC, with five clearly dressed human figures (Fig. 3.1; Brøndsted 1940). The Ertebølle culture graves from Dragsholm from north-west Zealand and Vedbæk in north Zealand, dated to 5400–3900 BC, further indicate that costumes could be elaborately decorated with animal teeth and shells, which provided both colour contrast and sound effect during movement (Brinch Petersen 1974; Albrethsen *et al.* 1976). Necklaces and pendants in amber have also been found and document the expression of status, aesthetic taste and identity (Ebbesen 1995; Vang Petersen 1998).

During the transition from the Mesolithic to the Neolithic period, when animal husbandry was introduced to Scandinavia, the first evidence of textiles appears at the Danish site of Tybrind Vig on west Funen (Bender Jørgensen 1990). These textiles are made in the needle-binding technique. The Tybrind Vig textiles are ^{14}C dated to c. 4200 BC. Two skeletons from Bolkilde on Als in South Jutland were found together with textiles also made in needle-binding technique (Fig. 3.2) and are dated to c. 3400 BC (Bender Jørgensen 1990). Coarser pieces more akin to basketry have been found in Tulstrup Mose in north Zealand (Becker 1947). All these textiles are made of fibres of plant origin, mainly lime bast. It is uncertain whether they have been used for costume or served other purposes.

The earliest direct evidence of the use of skin as clothing is a fragment of calfskin from Tværmose in west Jutland, ^{14}C dated to 3090–2950 BC (Ebbesen 1993, 125; 2009, 47–48). The object measures 16 × 3.5 cm and has remnants of fine sewing along one edge. The skin piece was found together with approximately 70 perforated hazelnuts and three small irregularly shaped amber discs on a string. This find demonstrates that skin technology was well developed by the Neolithic period in Denmark.

Textile tools are rare finds for this period.



Fig. 3.2. Textile in needle-binding technique from Bolkilde, Jutland, c. 3400 BC (Photo: R. Fortuna, National Museum of Denmark).

Few loom weights have been found in contexts dating to the Neolithic, most often in settlements, indicating the use of a warp-

weighted loom. Some examples are known from Lindebjerg on Funen, dated to c. 2000 BC (Jæger and Laursen 1983).



Fig. 3.3. Textile in plant fibre from Luseboj near Voldtofte on Funen, 9th–8th century BC (Photo: R. Fortuna, National Museum of Denmark).

Bronze Age

At present, 153 Danish Bronze Age graves containing textiles have been recorded. The majority of these are dated to the Early Bronze Age (Bender Jørgensen 1986, 289) and have been found primarily in Jutland. Only ten graves with textiles have been definitively ascribed to the Late Bronze Age. The small number of finds is primarily due to the cremation burial custom prevalent at the time, which is less favourable for textile preservation.

Bronze Age textiles are generally balanced tabbies with a very low thread count of about 3–6 thick threads/cm. Towards the end of the Bronze Age, the thread count gradually increases (Bender Jørgensen 1986, 289–290). The textiles often have a heavily fulled surface, allowing the fabrics to be cut without the edges fraying. In the Late Bronze Age, the first 2/2 twill weave appears in a grave at Haastrup on Funen (Bender Jørgensen 1986, 192, 293). This textile is spin-patterned with alternating 10s, 11z/8s, 10z threads and has 12/14 threads/cm. The rep-woven border of this piece has 30/6 threads/cm. This textile is very similar to the textiles from Hallstatt and Dürrnberg (*cf.* Grömer in this volume). By the end of the Bronze Age, twill supplants tabby as the most common weave.

The predominance of textiles with the z/s-twisted yarn combination common in the Early Bronze Age gradually changes to a preference for a s/s-twisted type. This transformation starts in period II, and by period III, it is evident in the entire present-day Danish area (Bender Jørgensen 1986, 290). In some graves, both z/s- and s/s-twisted textiles occur, indicating that they belong to the same tradition of textile production. The s/s twist remains the preferred combination well into the Early Iron Age. Bronze Age textiles made of wool are of rather homogeneous quality, indicating the existence of well-developed sheep husbandry (Ryder 1988). The fleece of these sheep contained very fine underwool and coarser hair. Such a combination is particularly suitable for fulling textile surfaces (Broholm and Hald 1940, 135–136). Surviving textiles further demonstrate that the majority of the available wool was naturally pigmented, and that white wool was rare. Yet, a belt from the female grave from Borum Eshøj in East Jutland had at least two hues, indicating that colour was

part of the textile design (Broholm and Hald 1940, 73–77). Textiles made in plant fibre also existed, but rarely survive. The only Bronze Age find of a textile in plant fibre comes from Lusehøj near Voldtofte on South Funen (Fig. 3.3). In this cremation burial, a nettle textile was found inside a bronze cauldron. The grave is dated to the 9th–8th century BC (Thrane 1984, 10). A wool textile was also found in the same grave and has an average thread count of 5/3 threads/cm. In comparison, the nettle textile is much finer with 18/13 threads/cm (Bender Jørgensen 1986, 192).

A few finds of flax seeds from settlements indicate that the flax plant was known and grown in the area during the Bronze Age (Runge and Henriksen 2007). Whether the plant was also used for textile production at this early stage is disputable. However, since the technology of producing textiles in nettle and flax is identical, and the raw materials were definitely available, it is likely that textiles in plant fibres were much more common than previously assumed.

The most spectacular and well known Bronze Age textile and costume finds come from the oak coffin graves at Borum Eshøj, Egtved, Skrydstrup, Trindhøj, Guldhøj and Muldbjerg dated to the 14–12th centuries BC (Fig. 3.4). In these graves, complete costume sets have been preserved, which provide information about both the making of the textiles and the use of the costumes (Broholm and Hald 1935; 1939; 1940). Among the preserved garments, some are gender specific, while others are more unisex, like the large rectangular textiles. Female dress consisted of gender-specific garments such as the tailored body-fitting blouses, string skirts that could be adorned with thin bronze tubes, belts with elaborate tassels, sprang caps and hairnets, as well as large rectangular cloth pieces that could be wrapped around the body and function as a skirt, dress, or mantle (Fig. 3.5). Male dress comprised gender-specific garments like the kidney-shaped cloaks, wrap-around garments often made from the corner pieces left over from cutting the cloaks, wrap-around garments, belts in textile and leather, and piled hats (Fig. 3.6; Broholm and Hald 1935; 1940; Nielsen 1971; 1979; 1980b; 1989).

Both sexes wore one-piece leather shoes with tie strings. The feet of the deceased in the graves were often covered with wool textile foot

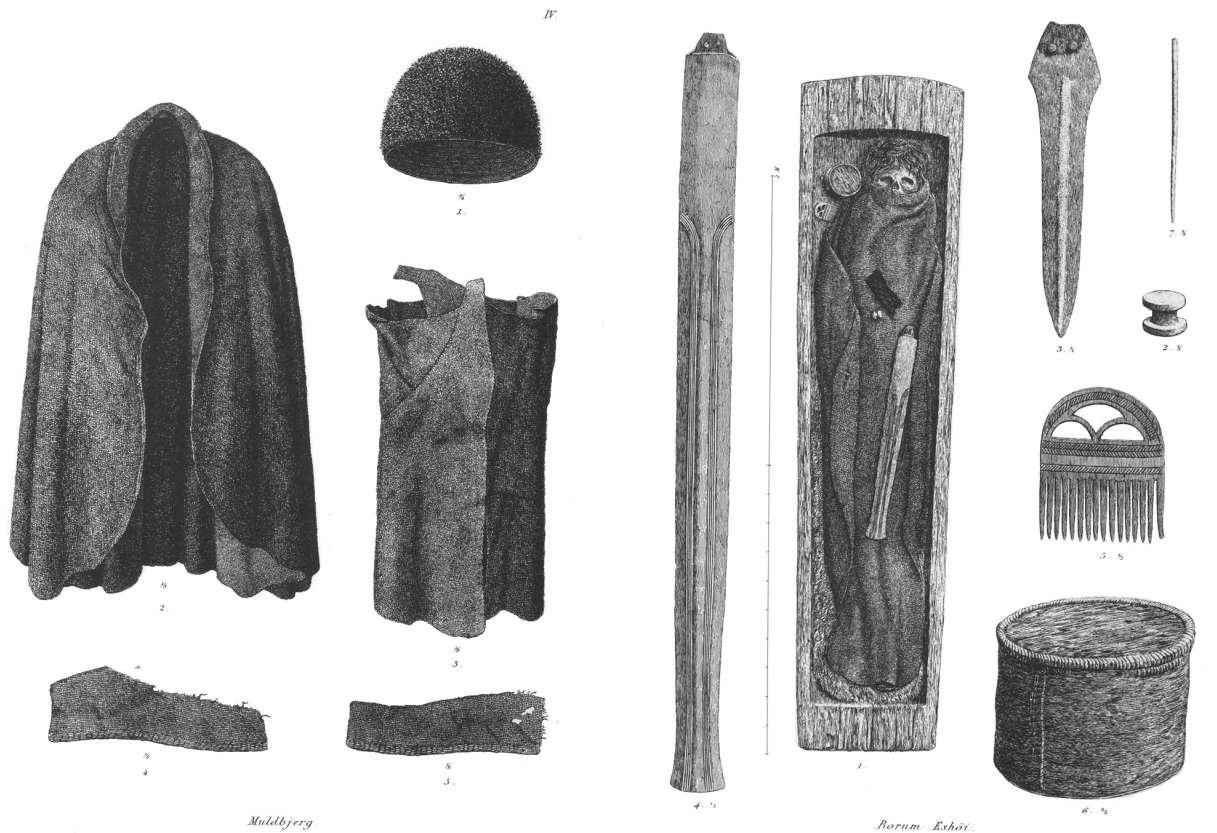


Fig. 3.4. Drawings of various costume items from the Early Bronze Age oak coffin graves (After V. Boye 1896).



Fig. 3.5. The costume of the Egtved girl from the Early Bronze Age (Photo: R. Fortuna, National Museum of Denmark).

Fig. 3.6. The costume of the old man from Borum Eshøj, Early Bronze Age (Photo: Roberto Fortuna, National Museum of Denmark).



wraps. Whether these foot wraps are symbolic or functional is not clear. A find from Guldhøj also indicates the use of wool textile shoes or mittens (Hald 1972, 22–26). Furthermore,

several leather shoes have been found in the Danish bogs, which are ^{14}C dated to the Late Bronze Age (Mannering *et al.* 2010). Thus, each of a pair of particularly large shoes from



Orbækgård in East Jutland, dated to 920–807 BC, is crafted of a single piece of rough hide with the addition of a gore (Fig. 3.7).

In the Early Bronze Age, garments could be elaborately decorated. Women's blouses were embroidered; men's cloaks and hats given a pile; finished textile edges ornately plaited; and belts adorned with complex tassels. Sewing was also used for joining separate pieces and, in rare cases, for mending. The sewing was mostly done with a fine 2-ply thread, which apparently also had a decorative function. The

stitches employed include running, overcast and buttonhole. Embroidery is documented on the female blouse from Skrydstrup in South Jutland, while on the male oval cloak from Trindhøj also in South Jutland, long, coarse threads were regularly stitched into the ground weave to give the garment a pile surface. On the hats from Borum Eshøj A in east Jutland, Trindhøj and Guldhøj in south Jutland, and Muldbjerg in west Jutland (Fig. 3.8), an exceptional, very dense pile of extremely thin threads ending in small knots was used to give

Fig. 3.7. A pair of shoes from Orbækgård, Jutland, 920–807 BC (Photo: R. Fortuna, National Museum of Denmark).

Fig. 3.8. Hat with a dense pile of very thin threads ending in small knots, Borum Esboj, Bronze Age (Photo: R. Fortuna, National Museum of Denmark).



the surface a uniform, furry look (Broholm and Hald 1940, 18–19). Finds of bone and bronze needles are known from various Late Bronze Age sites throughout Denmark (Hald 1980, 278).

The Bronze Age costume also included bronze ornaments such as string tubes, fibulae, torques, tutuli (small spiked discs which were probably sewn onto the costume), earrings, bracelets, belt plates and finger rings, the latter also in gold. Bronze tubes attached to string skirts would have made a tinkling sound when worn. Finds of bronze tubes in graves testify that the use of string skirts continued during the Late Bronze Age. As in the Stone Age, amber ornaments constituted an important class of accessories.

Danish Bronze Age costumes demonstrate that the inhabitants of southern Scandinavia during this period were skilled with needle and thread and familiar with cutting and shaping. A fascinating feature of the textile garments is that, despite being made in woven material,

many of them are produced in patterns that hark back to a costume tradition based on animal skins (Broholm and Hald 1935; Nielsen 1989). Some of the garments, such as the string skirt and the kidney-shaped cloak, are represented on contemporary bronze figurines (Kjærø and Olsen 1990, 68, 74) and rock carvings (Madsen 1981), demonstrating that dress played an important role in the Bronze Age world view (Kaul 1998; Kristiansen and Larsson 2005; Bergerbrant 2007; 2010).

Textiles provide evidence for the use of both the tubular warp technique as well as the warp-weighted loom technique. Only few loom weights and spindle whorls dated to the Bronze Age have been found in Denmark, and they do not become ubiquitous in the archaeological record until the end of the Early Iron Age (Bender Jørgensen 1986, 344–346). The oldest spindle whorl in the Danish archaeological material was found in a grave from Høje Tåstrup and is dated to the end of the Late Bronze Age (Hald 1980, 134).

Pre-Roman Iron Age

In contrast to the Bronze Age material, Danish textiles dated to the Pre-Roman Iron Age come from two contexts: graves and peat bogs. Only 13 published graves with preserved textiles are dated to the Pre-Roman Iron Age (Bender Jørgensen 1986, 294). To this can be added the material from two cremation graves from Hedegård in south Jutland analysed by Bender Jørgensen in 1992 (Madsen 1999). The textiles from these graves are preserved because they were in contact with metal objects such as bronze fibulae or vessels used as burial urns. While the textiles from the graves are very fragmentary, many of the costumes recovered from the peat bogs are almost intact. The costumes consist of a wide range of male and female garments and accessories in textile and skin (Hald 1955; 1980; Mannering and Gleba forthcoming).

The bog played an important role as a sacred place in the Pre-Roman Iron Age as the large number of human bodies and single objects deposited in the bogs demonstrate. While there is evidence of peat-digging in the bogs dating as far back as the Bronze Age, it becomes more extensive in the Pre-Roman and Roman Iron Ages. In the vicinity of the Pre-Roman fortified village of Borremose, a very large area had been dug for peat. It is not unlikely that the purpose was the production of iron. Some of these pits were then reused for the deposition of objects and in some cases bodies, as the three bog bodies found at Borremose demonstrate (Martens 1988; Christensen and Fiedel 2003). Among the most famous Danish bog bodies are the Tollund Man, the Elling Woman, the Haraldskær Woman, the Huldremose Woman, the three Borremose bodies, and the Grauballe Man (Fischer 2007; Asingh and Lynnerup 2007). The human bog finds have long been interpreted as punished criminals or sacrificed individuals. The latest research suggests that more differentiated interpretations are necessary (Ravn 2010). It is possible that the majority of the bog bodies can be perceived as part of a hitherto overlooked burial practice.

The Pre-Roman Iron Age textiles are mostly woven in 2/2 twill although tabbies are present as well (see Tables 3.1 and 3.2). The textiles often have an open structure with minimal surface treatment and a density

of 5–10 threads/cm. A grave find from Vilstrupgård in south Jutland has preserved remains of an unusual, very fine rep weave with 42/10 threads/cm, interpreted as a band. Its present width is approximately 2 cm, but as no selvages are preserved it may originally have been wider (Bender Jørgensen 1986, 194). In general, textiles are made from single yarn, with some regional variations (Bender Jørgensen 1986, 294–195). Most textiles are made in a combination of s/s-twisted yarn, but z/z, z/s and s/z combinations have also been found. On Bornholm, a variety of twist combinations occur in the textiles from Slusegård cemetery (Bender Jørgensen 1986, 294; 1996, 127).

The inhabitants of Pre-Roman Iron Age Denmark had access to high quality wool with a fibre diameter range similar to Bronze Age wool (Walton 1988; Mannering and Gleba forthcoming). Judging by the fibre diameter ranges in the yarn samples, it is evident that great attention was paid to the selection and sorting of the wool before spinning and weaving. The wool from the textiles is surprisingly fine and has given the textiles a nice drape and soft handle. Furthermore, the wool used in the textiles matches the fleeces in the skin costumes indicating that the same sheep variety was used for textiles and skin costumes (Mannering and Gleba forthcoming).

Fibre also provided new data on the provenance of textiles. A recently developed research method based on strontium isotopes was applied to the Huldremose II garment, and the findings indicated that it is composed of wool originating from at least three different locations (Frei *et al.* 2009b). One source is local, whereas the other two sources are compatible with geologically older terrains which are typical for northern Scandinavia, *e.g.* Norway or Sweden. This suggests that wool was exchanged as raw material more commonly and over longer distances than previously assumed.

Although the vast majority of textiles found in the peat bogs are wool, surviving due to the preservative qualities of this environment, textiles were also produced in plant fibre. Finds of flax stems in the bogs and the presence of linseeds among the stomach contents of the Tollund Man indicate that the plant was known and cultivated (Thorvildsen 1950; Karg 2003a; Fischer 2007). Furthermore, a close examination of the Huldremose Woman has

shown that she was also wearing a garment in nettle fibre (Gleba and Mannering 2010; Mannering and Gleba forthcoming). Although this find is unique, it opens the possibility that other bog bodies, such as the Tollund Man could also have been dressed in garments made of plant fibres, which have not survived in the bog (*cf.* van der Sanden 1996; Asingh and Lynnerup 2007). The production of plant fibre textiles is furthermore substantiated by the discoveries of sites which demonstrate evidence of the preparation of flax for the production of textiles. Pits used for retting flax were found in connection with the settlement of Frydenlund on Funen. Fragments of flax capsules from these pits have been dated to the Late Bronze Age (800–410 BC) and Pre-Roman Iron Age (420–350 BC) respectively (Runge and Henriksen 2007). Bundles of flax have also been found placed in ceramic vessels in bogs, interpreted as gifts to the gods (Karg 2003a; 2003b). The vessels were sometimes placed in pits related to ancient peat digging. Some of the pits may also have been used for retting before the sacrifices took place. It is therefore likely that linen garments were a part of the Pre-Roman Iron Age and even Bronze Age costume tradition.

In the Pre-Roman Iron Age, striped and checked fabrics became very popular, and colour patterns were used consciously as part of textile and garment design. Previously, it was believed that textiles from the Pre-Roman period in Denmark were not dyed, and that the patterns in the fabrics were only made by combining various shades of naturally pigmented wool: white, black, grey and brown. New analyses have demonstrated that the costumes were in fact much more colourful and that dyes were used in combination with naturally pigmented wool. In fact, the vast majority of the textiles found in Danish peat bogs tested positive for the presence of dyes of plant origin (Vanden Berghe *et al.* 2009; 2010). For instance, the Huldremose Woman from east Jutland wore a red scarf and a blue or purple skirt (Nørgård 2008; Frei *et al.* 2009b; Gleba and Mannering 2010; Mannering and Gleba forthcoming).

Natural organic dyes found in the bog textiles represent the three main categories of natural dyes, hence throwing new light on the use of biological dye sources in Early Iron Age Denmark. Among the detected dye

constituents are the flavonoid dye components luteolin, apigenin, quercetin and rhamnetin, the indigoid dyes indigotin and indirubin, as well as the anthraquinone dyes alizarin and purpurin (Vanden Berghe *et al.* 2009; 2010). Interesting comparison was also found with lichen dyes. The dyestuffs found in Early Iron Age Danish textiles fit well into the repertoire of dyes used throughout Northern and Central Europe during the Iron Age (*cf.* Grömer, Halvorsen and others in this volume).

As far as the dyeing technology is concerned, sometimes, the entire fabric was dyed in the same colour, while occasionally threads dyed in a contrasting colour were used to create a pattern during weaving. In some cases, the presence of several different dye components has been detected in the same fabric, which is probably a result of repeated dyeing. In particular, textiles patterned by using pigmented and white wool were often piece-dyed. The combination of naturally pigmented wool with different dyes expanded the palette of colours and hues available and enhanced certain patterns. Early Iron Age people were obviously familiar with dyeing technology and the various local dye sources (Vanden Berghe *et al.* 2009; 2010). The new dye analyses of the Pre-Roman Iron Age costumes have challenged and transformed our visual understanding of the costumes produced in this period.

A common feature of the textile garments from the Pre-Roman Iron Age is that they were almost all finished on the loom and only small alterations were made after the textile had been taken off the loom. The low thread density and non-fulled surface made them unsuitable for cutting, yet it does not mean that sewing was not used during the period. Textiles could be cut and sewn together, especially when repaired or reused. In such cases the sewing is often quite noticeable, as the sewing threads are much coarser than the yarn of the weave and/or are in contrasting colour to the latter. Sewing threads are most often made of paired threads rather than plied yarn as in the Bronze Age. The visual appearance of these textiles differs markedly from the preceding period and must have played a decisive role in the perception and understanding of costume.

The construction of the Pre-Roman Iron Age textiles was undoubtedly adjusted to the function of the garments, most of which were meant to be draped or wrapped around the

body and the legs, and/or fastened with the help of various devices, such as cords, pins and fibulae. Some costumes were found on the bog bodies, demonstrating their exact position and use, and others were placed next to, underneath, or around the bodies. While some garments were used in specific ways, others were multifunctional and could have been used as both garments and/or utilitarian objects. Thus, what could be generally described as wrap-around garments come in three relatively standardised sizes. The first group comprises textiles measuring approximately 100×50 cm, which often have fringes at the two narrow ends. An example is the scarf found with the Huldremose Woman (Fig. 3.9). The second group consists of larger rectangular pieces of fabrics measuring approximately 150×100 cm. An example of this group of wrap-around textiles was recovered with the Borremose III find in north Jutland; it was draped or wrapped around the body of a woman (Fig. 3.10). The third group consists of large pieces of approximately 260×140 cm. Such a textile was found in Thorup II in north Jutland and could have served various purposes: as a blanket, a cape or perhaps wrapped around the body.

Of particular interest are the tubular garments. The most famous of such items was discovered as a single find at Huldremose, the same bog where the female bog body was found. The Huldremose II textile measures about 256 cm in circumference (Fig. 3.11). The height of the garment (equal to the width of the textile) is 173 cm. It is too long to be worn without any kind of manipulation, and hence must have been folded in some way around the body. Unfortunately, the textile does not have any folds or wrinkles preserved that could reveal the manner in which it was worn. Another, not as complete, but similar tubular textile exists (Hald 1980, 76). Regrettably, the provenance of this textile is not known but the ^{14}C dating confirmed that it belongs to the Pre-Roman Iron Age costume tradition. This piece measures 248×126 cm and could have been worn without folding. The tubular textile from Huldremose II has long been interpreted as a female garment based on a comparison with the Greek peplos (Hald 1950; 1980; Munksgaard 1974), but there is no evidence connecting either of the two tubular garments specifically with women; nor is there evidence for this way of wearing the costume. Seen

together with the other wrap-around textiles, it is likely that these garments were used by both sexes in a variety of ways (Mannering and Gleba forthcoming).

Gender-specific garments also appear among the bog finds. Particular for women are long skirts and sprang caps, while leg wrappers and skin caps are connected to male contexts. A pair of leg wrappers sewn together for secondary use as a blanket for a small child was found in the Thorup I find in North Jutland (Petersen 2008). They have been ^{14}C -dated to 360–50 BC (Mannering *et al.* 2010).

The vast majority of Pre-Roman Iron Age textiles recovered from the Danish peat bogs were made with a tubular warp. This means that they were not woven on a warp-weighted loom. The tubular-warp textiles require a loom with at least two fixed beams around which the warp can be wound. A textile produced this way will have warp loops at both ends. This production method possibly explains why there are so few loom weights from the Pre-Roman Iron Age in Denmark (Bender Jørgensen 1986, 344). A few clay spindle whorls have been recorded from graves and settlements (Bender Jørgensen 1986, 344). The spindle itself is usually not preserved, as it was probably made of wood, but the whorls could be produced in a variety of different shapes and sizes. An unusual spindle with an integral weight made from hazelwood (Fig. 3.12) was found among the objects from the Hjortspring bog find in south Jutland, which is dated to the Pre-Roman Iron Age (Broholm and Hald 1940, 108–109). Another technique still in use in this period is sprang.

Skingarments constitute an equally important part of the Pre-Roman Iron Age costumes as the textiles. They constitute about 40% of all garments found in the Danish peat bogs. The vast majority of them are skin capes, but other garments and accessories such as hats, belts, bags and shoes also occur. The majority of the bog skins derive from domesticated animals such as sheep, goat and cattle. A few examples of wild mammal skins from deer, otter and wolf appear in the archaeological record. In general, the skin garments are well prepared (cured), tailored and follow standardised patterns, which probably continue earlier costume traditions. The majority of the skin capes can be divided into two types, which were produced using several pieces of skin fitted together according to a set pattern (Mannering



Fig. 3.9. The Huldremose Woman's costume with the outer skin cape, scarf and skirt, 192–61 BC (Photo: R. Fortuna, National Museum of Denmark).



Fig. 3.10. A textile from the Borremose III Woman, Jutland, 396–235 BC (Photo: R. Fortuna, National Museum of Denmark).

and Gleba forthcoming). Symmetrical capes have a trapezoid shape with collar, revers, and often reinforced laces for fastening. This type was made according to a standardised

pattern from seven separate large pieces of skin: five almost rectangular, with two at the top and three at the bottom on the back, and two oblong L-shaped pieces in front. Smaller

Fig. 3.11. The Huldremose II textile, Jutland, 180–50 BC (Photo: R. Fortuna, National Museum of Denmark).



pieces make up the corners at the bottom. An example of this type of cape have been found, for instance, at True Mose in north Jutland (Fig. 3.13). Less common are asymmetrical capes. They have a slanting neckline, where the large middle piece is cut asymmetrically. Two complete asymmetrical capes were found

with the Huldremose Woman (see Fig. 3.9). A third, not so common, cape pattern consists of four equal rectangular pieces sewn together, as in the cape from Baunsø in north Jutland (Fig. 3.14). Evidence suggests that the skin capes were scaled to fit the wearer.

Design, cut and seams demonstrate that the



Fig. 3.12. (left) Spindle with an integral weight made from hazelwood from Hjortspring, Jutland, Pre-Roman Iron Age (National Museum of Denmark).



Fig. 3.13. Skin cape from Trøe, Jutland, 180–1 BC (Photo: R. Fortuna, National Museum of Denmark).

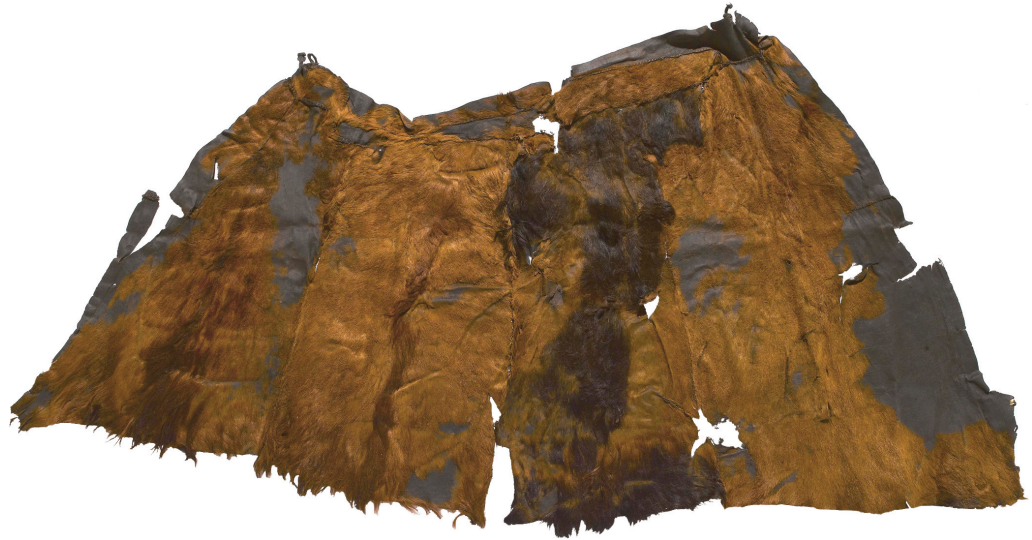


Fig. 3.14. Skin cape from Baunso, Jutland, AD 65–130 (Photo: R. Fortuna, National Museum of Denmark).

makers of skin garments were skilled craftspeople. Although skin costumes required less time to produce than textiles, it is not uncommon that they were continuously repaired or patched. For example, the inner cape of the Huldremose Woman has 22 patches. In several cases, capes have been found in pairs and were probably worn one on top of the other. The outer cape would have had the fur turned outwards, and the inner cape, the fur turned inwards. In all

likelihood, the use of capes was flexible and depended on the season and weather. The various cape types do not appear to be gender specific, but it is possible that they were worn in different ways by men and women.

Shoes have also been found in the Danish bogs, either in association with bodies or as single deposits. The typical shoe consists of a single piece of hide or skin without a separate sole, just as in the Late Bronze Age (see Fig. 3.7). Occasionally, they have smaller additions such as a tongue, instep gores or laces. The piece of skin or leather was usually folded around the foot and held in place by leather laces. This flexible construction meant it was not necessary to make any cuts or preparation

work in order to make shoes fit one foot or the other. This construction also gave each shoe a distinct individual look. The fact that the shoes are clearly identifiable as left or right suggests that they were worn regularly and, once they had acquired their shape, were not manipulated in any way. Raw fibres or reused textiles were occasionally placed inside the shoes as lining or insulation, as in the case of the shoe from Fræer in north Jutland and Søgård I in west Jutland (Mannering and Gleba forthcoming).

Roman Iron Age

In 1986, 373 graves dated to the Roman Iron Age containing textiles were recorded in Denmark (Bender Jørgensen 1986, 296). Since then new finds have not been recorded systematically, although many new locations with textile finds have been excavated (Munksgård and Østergård 1988; Mannering 1995; Bender Jørgensen 1996; Nielsen 2000; Demant 2000; 2007; Hedeager Krag 2004; Ræder Knudsen 2010; Lund Hansen *et al.* forthcoming). Nevertheless, the hitherto published material forms a solid statistical basis for evaluating Danish Roman Iron Age textile production. Graves with textiles have been excavated in all parts of Denmark but the majority were found in Jutland, as in the preceding periods. The textile finds from the Early Roman Age are slightly more numerous than those from the Late Roman Iron Age.

One of the most well known graves from this period is the Lønne Hede I female burial in Denmark. A substantial number of textile fragments have been recovered from this grave (Munksgaard 1971; Munksgaard and Østergaard 1988; Frandsen 2001). The costume probably consisted of a long skirt, a sleeveless blouse, a scarf placed around the head, and a blanket or cloak. Dye analyses have shown that the different garments combined blue, red and white yarns (Bender Jørgensen and Walton 1986, 181; Walton 1988, 155).

Apart from graves, textiles dated to this period have also been found in bogs (Hald 1980; Mannering and Gleba forthcoming) as well as weapon deposits (Möller-Wiering 2010; 2011). The weapon deposits at Illerup Ådal in east Jutland, Nydam in south Jutland and Vimose on Funen contained thousands of weapons and other objects, allowing reconstructions not only of weaponry but of

the army structures, war strategies and rituals of sacrifices to the gods. Numerous textiles were preserved primarily as mineralised traces in contact with metal objects. In contrast to finds from the bogs and graves, the textiles from weapon deposits were associated only with weaponry, without contact with human bodies. Good quality textiles were used for wrapping *e.g.* lanceheads and shield bosses. Often each item was wrapped individually, but sometimes a textile was placed around them to form a small bundle. It appears likely that pieces of large rectangular cloaks were used for this purpose. Cuts in some wrappings indicate that the textiles were ritually damaged like the weapons before being sacrificed.

Silver clasps found at Nydam may have belonged to tunics or perhaps trousers and demonstrate that complete pieces of clothing were deposited as in Thorsberg in Schleswig, north Germany, where complete garments were preserved (*cf.* Möller-Wiering and Subbert in this volume). A variety of textile qualities was also found between the planks of the so-called Nydam boat, used as caulking material (Möller-Wiering 2010; 2011).

The Roman Iron Age textiles are predominantly made in 2/2 twill, a weave generally recognised as an indicator of Early Iron Age textile technology. Towards the end of the Roman Iron Age, the use of tabby becomes more common. The majority of textiles are made of wool but, during the subsequent Late Iron Age, the preference for producing tabby textiles of plant fibre gradually increases (Mannering 1998). Evidence of organised local production of plant fibres for textiles in the Roman Iron Age is found at the settlement site of Seden on Funen. Preserved stems of both flax and nettle have been found in pits at this site dated to *c.* AD 200–400 (Gotfredsen *et al.* 2009).

The thread counts in Roman Iron Age textiles average approximately 10–15 threads/cm, increasing towards the end of the period, when high quality textiles have up to 40 threads/cm (Bender Jørgensen 1986, 298–299). New in this period is diamond twill, which by the Late Roman Iron Age makes up almost 25% of all textiles (Bender Jørgensen 1986, 296–297). A change in the twist direction also takes place in the material as the s/s twist gradually loses the predominant position it held in the Early Roman Iron Age and almost



disappears from the record towards the end of the period (see Tables 3.1 and 3.2). Thus, the z/z-twisted textiles dominate the Late Roman Iron Age, while z/s-twisted textiles are represented throughout the entire period (Bender Jørgensen 1986, 298). Spin-patterned fabrics appear primarily at the end of the period (Bender Jørgensen 1986, 345–346),

although one spin-patterned textile found in a bog in north Jutland has been ¹⁴C dated to the Pre-Roman Iron Age (Mannering and Gleba forthcoming).

The textile material from Bornholm, which derives primarily from the cemetery of Slusegård, differs significantly from the rest of the contemporaneous Danish textile

Fig. 3.15. Leg wrappers from the male body from Sogård II, Jutland, AD 130–340 (Photo: R. Fortuna, National Museum of Denmark).



Fig. 3.16. Sleeved garment from Møgelmose (Photo: R. Fortuna, National Museum of Denmark).



Fig. 3.17. Shoe from Arnitlund (Photo: R. Fortuna, National Museum of Denmark).

material. Throughout the Roman Iron Age, the occurrence of diamond twills is higher here than anywhere else and s/s-twisted textiles do not occur at all, in contrast to Jutland (Bender Jørgensen 1986, 296–299). Bender Jørgensen's interpretation is that the Bornholm material represents a kind of standardised production with the use of z/s-twisted diamond twills with a pattern unit of 20/18 threads, categorised by her as the Virring type (Table 3.2), although a place of production cannot be determined (Bender Jørgensen 1986, 301).

A more widespread use of dress accessories such as paired fibulae on the shoulders is evident in female graves throughout Denmark in the Roman Iron Age. The fibulae have been linked to the use of the tubular garments, such as that found in Huldremose II in east Jutland. This manner of wearing and using jewellery becomes an important characteristic of the female costume, and continues into the later periods (Jørgensen and Jørgensen 1997, 59).

During the Roman Iron Age, changes take place not only in textile technology and appearance but also in costume construction. Thus, the use of tubular garments seems to continue into the Roman Iron Age together with the more frequent use of fibulae, but at the beginning of the Common Era, new garment types also appear. These garments are tailored and the textiles appear to be adapted for cutting. New garment types include tunics with or without sleeves and trousers. While none of these garments has been found in present-day Denmark, they are known among the contemporary finds from the north German bogs, *e.g.* Damendorf, Marx Etzel and Obenaltendorf, as well as from the weapon deposit at Thorsberg (Schlabow 1976; *cf.* Möller-Wiering and Subbert in this volume). On the other hand, a pair of leg wrappers has been found wrapped around the lower legs of the male bog body from Søgård II in West Jutland, ¹⁴C-dated to 130–340 AD (Fig. 3.15; Simonsen 1996). New textile weaves, such as the Virring type and spin-patterned weaves, also become more important at this time. These new trends in textile and garment types are probably the result of influences or inspiration from Central European costume traditions (Wild 1968; 1985; Wild and Bender Jørgensen 1988).

One of the best preserved textiles demonstrating these new trends was found in the

Skærsø bog in South Jutland, and measures 200 × 150 cm. It is ¹⁴C-dated to 350 BC–AD 90 (Mannering *et al.* 2010). The textile has tablet-woven borders on all four sides and three corners with preserved tassels. It was probably red with white edges and purple tassels (Nørgaard and Østergaard 1994; Vanden Berghe *et al.* 2009). It is woven in 2/2 diamond twill with a pattern unit of 10/13 threads, resulting in a very clear square block pattern. It is made of z/s-twisted threads and can be categorised as a Virring type fabric. This textile was most likely used as a cloak, but as a single deposit, nothing is known about its origin and use.

There are also a few examples of textiles from graves that use a particular type of in-woven stripes in the fabrics, which is unusual and rarely seen in other Danish textiles from this period. One such example comes from Tornebuskehøj in west Jutland, dated to the 1st century AD (Hald 1980). All of them are found in graves with special features and grave goods imported from the Roman sphere. While these textiles are characterised as local products, they demonstrate a clear influence from contemporary Roman and Central European cultural spheres. Sprang continued to be used in this period, while tablet weaving was introduced to Scandinavian textile technology some time during the final centuries leading to the Common Era. It is traditionally linked to the warp-weighted loom, since starting borders are generally made in this technique, but it is not a definitive indicator of the loom used. The technique in this period is also known for making broad, decorative edges on cloaks that are made with loops on all four sides similar to the textiles produced with a tubular warp (Wild and Bender Jørgensen 1988; Ræder Knudsen 2010; 2011; Möller-Wiering 2010). The earliest known tablet-woven textile in Denmark is the above-mentioned complete mantle from Skærsø, but numerous fragmentary pieces from bogs, graves and weapon deposits confirm that this technique became increasingly popular in textile production during the Roman Iron Age in Denmark. The earliest examples of tools for tablet weaving are the two wooden tablets found in Dejbjerg bog in West Jutland, dated to the 1st–3rd centuries AD (Ræder Knudsen 2010). On Bornholm, during the Early Roman Iron Age, borders were primarily made in rep,

while in the Late Roman Iron Age they are all tablet-woven (Bender Jørgensen 1986, 302).

The use of skin garments also continued into the Roman Iron Age made to the same patterns as in earlier times. A skin cape found in Refstrup bog in South Jutland and ¹⁴C dated to AD 130–630 is made in an asymmetrical pattern, similar to the capes present among Pre-Roman Iron Age bog finds. This indicates that the making of skin garments followed a more conservative tradition than that which is evident for textile production.

Apart from the skin capes, however, new skin garment types appear in this period. Among them are a wrap-around garment from Søgård I and a sleeved garment from Møgelmoose in south Jutland (Fig. 3.16). The sleeved tunic from Møgelmoose is of special interest since its shape has parallels among the north German textile finds dated to the Roman Iron Age (Ebbesen 2009; cf. Möller-Wiering and Subbert in this volume).

Several shoes dated to the Roman Iron Age have been recovered in Danish bogs. While the Pre-Roman Iron Age tradition of a single-piece shoe wrapped around the foot and fixed with straps continues, a tongued or open-work type of shoe also appears. Examples have been found at Risehjarup and Arnitlund in south Jutland (Fig. 3.17). This type is possibly inspired by Roman footwear (van Driel Murray 2001), but the fact that the Danish examples are made from cured rather than tanned skins and that the hairy side is always used as lining reveal that they were produced locally. There do not seem to be any differences in the types of shoes worn by men and women, and shoes for children are also of similar construction, only smaller. Other items made from skin are caps and belts. Skin accessories include a bag made of an entire animal carcass found at Oksenbjerg (Mannering and Gleba forthcoming).

Spindle whorls made of clay, sandstone, glass or metal in a variety of different shapes and sizes have been found in Roman Iron Age female burials. Loom weights are primarily found on settlements and become increasingly more common during the Late Roman Iron Age, indicating a more extensive use of the warp-weighted loom (Bender Jørgensen 1986, 346). Several spindles and loom weights have been recovered in the Late Roman settlement at Vorbasse in south Jutland and

its contemporaneous graves (Andersson Strand and Mannering in press). The loom weights weigh between 170 and 350 g, and are all ring-shaped (Lund Hansen *et al.* forthcoming), the most common type in Scandinavia (Nielsen 1999, 48). From this period onward and into the Late Iron Age, loom weights are often found in association with a new type of dwelling connected to the settlements, the pit-house. These small houses with their sunken floor construction were used as workshops not only for weaving but also as potteries, smithies *etc.* (Bender Jørgensen 1986, 355–356). Needles in bronze or iron also become more common, possibly reflecting a shift towards tailored garments.

Conclusions

The study of Danish prehistoric sources yields a detailed if incomplete picture of textile production and costume tradition in Scandinavia. Animal skin appears to be the first material adapted for costume, and the tradition for tailoring skin costumes runs parallel with the traditions of making textile costumes. The Bronze Age preference for textiles in tabby gradually changes in favour of twill, which becomes an indicator of Iron Age textile technology. As early as the Stone Age, the technique of producing threads in plant fibre is known, but it is not until the Late Bronze Age that the first woven textiles in plant fibres appear. Although installations connected to the processing of plant fibres, as well as seeds and stems of flax are known, linen and nettle textiles are rare before the end of the Roman Iron Age. It is only in the Late Iron Age that linen textiles clearly form an integral part of costume. The loom technology in the Early Bronze Age is diverse and several concurrent techniques may have been used. The textiles from the Pre-Roman Iron Age are, on the other hand, woven with a tubular warp, and it is only at the beginning of the Common Era that the use of the warp-weighted loom is securely attested in the textile material together with the tablet-weaving technique.

It is noteworthy that, throughout the prehistoric periods considered here, the development in the raw materials selected for producing garments and the development of textile technology do not always follow changes in costume tradition. Based on the available

evidence, it is assumed that the costumes of the Stone Age were primarily made from animal skins and hides. On the other hand, there can be no doubt that the techniques of spinning thread and cord making, and the use of raw materials of plant origin like tree bast, grass or possibly wild nettle were known long before the archaeological finds reveal. The skin costume tradition continued to influence the textile costume tradition of the Bronze Age, when textiles were primarily made of wool. Due to changes in the burial customs, few textiles survive from the Late Bronze Age. The transition from Bronze Age to Iron Age textile technology cannot be fully understood. Probably the major difference between the Bronze and Pre-Roman Iron Age costume tradition is that, in the former, garments were often tailored, while in the latter, costumes were draped around the body of the wearer. The Pre-Roman Iron Age textiles were used in the shapes produced on the loom, *i.e.* not cut and tailored, and the textiles were adapted and designed for this function. Thorough analyses of the textiles from the Pre-Roman Iron Age have further demonstrated that, in spite of the fact that they are all produced within local and individual households, they represent a strong, uniform and widespread craft tradition. At the same time, it is definitely a period when new techniques were tested and experimented upon. The raw materials were exchanged over long distances.

In the Roman Iron Age, examples of garments constructed by cutting the textiles reappear. The change in weaving technology and raw materials allowed the textiles to become thinner and more densely woven, and thus more suited for cutting and tailoring. Tubular garments are still used, and the Roman Iron Age is a period when old and new costume traditions converge to form new mores. The Danish textile finds clearly prove that there was an established Scandinavian handicraft tradition, which influenced the overall visual appearance of the textiles produced in different periods. Furthermore, different craft traditions were in place for the production of garments made from textiles and skin/leather. Often, it is this fascinating mix of old traditions with innovations, new technologies and access to new raw materials, which enable the textile archaeologist to characterise the design and technical capacity of prehistoric peoples.

Note

- 1 Much of this new data and high quality images can be found at <http://oldtiden.natmus.dk>

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GERMANY

Early Bronze Age (Reinecke BzA)	2200/2000–1600 BC
Middle Bronze Age (Bz B–C)	1600–1300 BC
Late Bronze Age (Bz D, Ha A–B)	1300–800 BC
Hallstatt C (Ha C)	800–600 BC
Hallstatt D (Ha D)	600–500 BC
La Tène Culture (Lt)	500–1 BC
Early Roman Iron Age (B1–2)	AD 1–150
Late Roman Iron Age (C1–3)	AD 150–375
Migration period	AD 375–600

DENMARK

NORTH SEA

BALTIC SEA

HOLLAND

GERMANY

POLAND

CZECH REPUBLIC

FRANCE

AUSTRIA

SWITZERLAND

82 numbered sampling locations are marked on the map, distributed across Germany and surrounding regions. The numbers range from 1 to 82, with some locations having multiple numbers (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82).

Map 4.1. Germany. Sites mentioned in Chapters 4 and 5:

1 Almdorf	29 Grundfeld	57 Riekofen
2 Altdorf	30 Harrislee	58 Rietzmeck
3 Asperg	31 Heidenau	59 Rössen
4 Bad Frankenhausen	32 Höresham	60 Röst
5 Bastheim	33 Hohmichele	61 Schaliß
6 Behringen	34 Hoppstädten	62 Schöningstedt
7 Behringersdorf	35 Hornstaad	63 Schwarza
8 Beilngries	36 Hügelsheim	64 Schwenderöd
9 Bescheid	37 Irsch	65 Sonnenberg
10 Bodman	38 Jühdenerfeld	66 Steinheim
11 Boostedt	39 Kayhausen	67 Steinheim an der Murr
12 Bornitz	40 Kemathen	68 Straubing-Ortler
13 Breungenborn	41 Kemmathen	69 Thürkow
14 Briedel	42 Kiebitz Moor	70 Triftlfing
15 Buch	43 Konz-Filzen	71 Udenheim
16 Burgweinting	44 Latdorf	72 Uelsby
17 Damendorf	45 Luttum	73 Uelversheim
18 Dehnsen	46 Mühlen-Eichsen	74 Uffing
19 Dietzhausen	47 Mühlthal	75 Untermässing
20 Ditzfurt	48 Nebel	76 Unterteutschental
21 Döhren	49 Nieblum	77 Wallscheid
22 Eberdingen-Hochdorf	50 Odernheim	78 Wallwitz
23 Feddersen Wierde	51 Pellingen	79 Wangen
24 Fellbach-Schmieden	52 Pestenacker	80 Weyhausen
25 Flintbek	53 Porz-Lind	81 Wiepenkathen
26 Gevelinghausen	54 Quelkhorn	82 Worms-Herrnsheim
27 Grabenstetten	55 Reepsholt	
38 Gräfenhainichen	56 Reinheim	

Germany: Bronze and Pre-Roman Iron Ages

Susan Möller-Wiering

Introduction

In Germany, textiles from the Bronze Age and the Pre-Roman Iron Age¹ have been a topic of interest for over a hundred years. Yet, in comparison to the size of the country and the long time span, the actual amount of extant fabrics – a few hundred items – is rather scanty. From the beginning, when interest in prehistoric costumes developed, the lack of material from Germany forced scholars to rely to a great extent on some well-known Danish finds (*e.g.* Girke 1922; Schlabow 1937; 1962). Over time, pieces of textiles were recorded at various locations. Although these finds increased our knowledge of textiles enormously, it is the technical aspects and the use of textiles in graves rather than the question of costume, which is illuminated by the majority of the scattered fragments. As late as 2000, archaeologist Johanna Banck-Burgess still primarily depended on the Danish material when describing Bronze Age clothing. As far as the Iron Age is concerned, the situation is much the same, although some iconographic and written sources shed a little more light on the period.

Generally, Bronze Age and Pre-Roman Iron Age material has been recovered from

burials. The princely burials – particularly at Eberdingen-Hochdorf and, to a lesser extent, at Altheim-Heiligkreuztal (Hohmichele) – do play an extraordinary role and are treated separately in this volume by Johanna Banck-Burgess. Both sites are located in south-west Germany and are dated to the Hallstatt Period. Bogs contributed only little to the textile corpus of the period. For the Bronze Age, there are two finds from the very north (Ehlers 1998b, 10), while five bog bodies with textiles ¹⁴C to the Pre-Roman Iron Age came to light in the northern lowlands. However, the latter provide much less information than the contemporary Danish bog finds (*cf.* Mannering *et al.* in this volume).² A few Bronze Age fabrics come from caves and, for the final phase of the Iron Age, some items from settlements can be added.

Leaving aside natural conditions such as climate and soil, the quantity and distribution of extant textiles are primarily related to two factors. The first is the type of burial. As a rule, the probability of finding textiles is much higher in an inhumation grave than in any kind of cremation grave. Due to the diversity of cultures and groups present in Germany during prehistory, it is obvious that the geographical, as well as chronological

distribution of textile material is very uneven. The second factor is the type and quantity of grave goods, since textiles often are preserved in contact with metal objects. Furthermore, the recovery of the preserved textiles is influenced by the awareness of their importance by archaeologists and conservators. Particularly in the early literature, it was often noted that some textiles had been observed during the excavations but, unfortunately, the material was neither documented in any detail nor preserved. Many of these hints are mentioned in the current literature (*e.g.* Banck-Burgess 1999), although they will not be considered here.

Chronological and Cultural Background

To describe *the* cultural background of Bronze Age and Pre-Roman Iron Age textiles in Germany is not the aim of this chapter; the situation is too diverse during this long period of time under consideration. Therefore, only an outline will be provided, following Karl-Heinz Willroth (1992), Albrecht Jockenhövel (1994), Wolf Kubach (1994) and Thomas Puttkammer (2007). Of course, the boundaries of prehistoric populations are not consistent with today's borders within the country. However, the names of the federal states (*Bundesländer*) are used here to give a rough regional overview.³ The chronological frame is not uniform, either. While in south and central Germany, the beginning of the Bronze Age may be set around 2200–2000 BC, its onset is a little later in the north. The same situation can be seen at the other end of the relevant period. Since the arrival of the Romans took place at different times in different regions and the entire north-east of Germany never became Romanised, it is decided to cover here the material dated up to the beginning of the Common Era (*cf.* Bender Jørgensen 1992, 16). The following period is considered by Möller-Wiering and Subbert elsewhere in this volume.

The chronological differences between north and south Germany reflect a border between two main regions of influence. While the south, up to the southern rim of the lowlands, was connected to the neighbours in the east, west and further south, northern Germany was influenced by Scandinavian

cultures. In the south, the Bronze Age is usually divided into three main periods, *i.e.* the Early, Middle and Late Bronze Age. While the Early Bronze Age was marked by flat flexed burials in most areas, barrow burials with inhumations became common during the Middle Bronze Age and finally flat urn burials characterised the Late Bronze Age. A more detailed system to define the Bronze Age was proposed by Paul Reinecke (1902–1911).⁴ It consists of six phases: Bronze Age Bz A–D and Hallstatt Ha A–B.

The most important cultural group of the Early Bronze Age (Bz A) was the Aunjetitz (Únětice) culture with its centres in the Czech Republic and Poland (*cf.* Belanová-Štolcová, Maik in this volume), but also covering eastern Germany. Weapons and jewellery have been preserved in hoards and graves, including some princely burials under large mounds. The south was occupied by several smaller Bronze Age groups, while in the north, Neolithic cultures still prevailed. During the Middle Bronze Age (Bz B–C, *c.* 1600–1300 BC), the entire southern half of the country and neighbouring regions belonged to the Tumulus culture with its many regional groups. Most often, inhumation graves were laid out under mounds, but cremations were not uncommon either. The Tumulus culture also influenced the lowlands further north as far up as the river Elbe. Finally, during the Late Bronze Age (Bz D, Ha A–B) which lasted until *c.* 800 BC, the Urnfield culture dominated most of the region, again split up into regional groups and reaching far to the south-west as well as to the south-east beyond the German borders. As indicated by its name, cremation burials were typical, although inhumations under barrows still occurred. During this period, the areas furthest east belonged to the Lausatian/Lausitz culture which had its centre in Poland (*cf.* Maik in this volume) and had much in common with the Urnfield culture.

The last two phases of the Bronze Age (Ha A and B), from *c.* 1200 BC onwards, may also be described as the early phases of the very diverse Hallstatt culture. In phase Ha C, the first iron swords appeared, while bronze was still used to make weapons. Hallstatt D, from *c.* 600–500 BC, clearly belonged to the Iron Age. Geographically, the Hallstatt culture stretched from France to the south-eastern Alpine region. It is usually divided

into an eastern and a western zone, with most of Germany belonging to the latter. Characteristic of the Late Hallstatt period are large tumuli under which high-status persons were buried in extremely rich graves, as in the sites of Eberdingen-Hochdorf (*cf.* Banck-Burgess in this volume) and Hohmichele. Such graves contained, *inter alia*, chariots and Mediterranean imports.

Evolving from the western Hallstatt culture, the La Tène culture developed *c.* 500 BC. It covered the entire southern part of Germany, as well as parts of France, Switzerland, Austria and the Czech Republic. The people of the La Tène culture were the Celts. According to Reinecke, this period can be divided into four phases, Lt A–D, with A and B often left undistinguished and described as Early La Tène, which lasted until *c.* 300 BC. The transition between Lt C and D, *i.e.* the Middle and Late La Tène, may be drawn between 150 and 100 BC. The Celts integrated many cultural impulses from their Mediterranean neighbours. Their burial traditions varied regionally and chronologically. In the first phase, very rich graves similar to those from Ha D were still accorded to high-status individuals. Later, inhumations as well as cremations were common.

A large area in the west and in the middle of the country, including Rheinland-Pfalz, Saarland and parts of Nordrhein-Westfalen and Hessen, was inhabited by people of the Hunsrück-Eifel culture (HEK) which can be considered part of the Late Hallstatt/Early La Tène culture. Its early phase (HEK I) dates from the end of the 7th century to *c.* 480/470 BC. Its late phase (HEK II) lasted until *c.* 300 BC. From the second half of the 6th century BC onwards, the influence of the Hallstatt and, later, La Tène sphere grew rapidly within HEK. One of these southern characteristics is represented by some very rich graves containing chariots and Mediterranean imports.

The northernmost areas of Germany were culturally closely connected to Scandinavia. The Bronze Age in this region may be divided into the Periods I–VI, following the system of Oscar Montelius (1885). The Periods I–III constitute the Early Bronze Age, lasting from *c.* 2000/1800 to 1200 BC, while Periods IV to VI belong to the Late Bronze Age, which covered the time from *c.* 1200 to 600 BC. The

Early Bronze Age was mainly characterised by inhumations under barrows, often including a great number of bronze objects. Towards its end, cremations became common, at first still covered by mounds. From the Late Bronze Age, more flat cremation burials are known and the number of metal grave goods decreased remarkably.

During the Iron Age, the most important group north of the Hunsrück-Eifel culture was the Jastorf culture including the Nienburg group on its south-western border. The Jastorf culture evolved *c.* 600 BC from the Nordic Bronze Age but then integrated southern influences. In the beginning, it covered Schleswig-Holstein and large parts of Niedersachsen, but later spread further south-west and east. The 600 years of the Jastorf culture are divided into five phases, corresponding to Ha D and Lt A–D in southern Germany. The burial traditions are diverse, with mounds, flat graves and cremation burials in pits. As a rule, the graves reveal only a few goods.

To summarise: during the Bronze Age as well as the Iron Age, the main part of present-day Germany was oriented southwards while the northern regions were linked to Scandinavia. In the south and in the centre, the Bronze Age lasted from *c.* 2200/2000 to 800 BC, while it started and ended a little later in the north. In the first phases of the Bronze Age, inhumations dominated. Later, cremations became common and fewer metal objects were placed in the graves, thus decreasing the chances for textile survival. The princely graves of the Hallstatt culture in the south-west are an exception that confirms the rule.

Research History

Some Bronze Age textiles were examined in detail and published already in the late 19th century by Johanna Mestorf (1875) and Georg Buschan (1889). The latter not only presented a catalogue of hitherto recovered prehistoric textiles in Central Europe, but on the basis of chemical and microscopic investigations also determined the materials that had been used to make them.

During the first half of the 20th century and up to the 1950s, the main research focus was on weaving tools and their technical details from the Stone Age onwards, particularly the use of the warp-weighted loom (*e.g.* von

Kimakowicz-Winnicki 1910; Schlabow 1937; 1976; La Baume 1955; Rosenfeld 1958). After a long hiatus, Josef Winiger took up this question again in 1995. Walter von Stokar (1938) took a somewhat different approach and was not only interested in the loom, but also in the fibre materials, publishing a catalogue of prehistoric textiles from Germany, Switzerland, Denmark and Sweden.

More recently, the focus usually has been on the textiles themselves and their changing appearance. Beginning in the 1950s, Hans-Jürgen Hundt investigated and published many prehistoric textiles, mainly in rather brief reports. They cover material from some 40 graves of the Hallstatt and La Tène periods, found in southern Germany, Austria, Switzerland and France (Bender Jørgensen 2005, 133). Hundt's primary interest was in the technical aspects of the fabrics. In 1971, based on his experience he presented a "summing-up of the development of textiles in Central Europe from the Neolithic to the Migration period" in his report on the princely grave of Worms-Herrsheim (Bender Jørgensen 2005, 133). Friedrich Just compiled the material found in north-eastern Germany, in Mecklenburg-Vorpommern, from the Neolithic period onwards, together with a brief discussion of the textiles' functions (Just 1964).

The most comprehensive work on collecting and examining material was published by Lise Bender Jørgensen. Her volume on Scandinavian prehistoric textiles (1986) also dealt with the northernmost part of Germany, Schleswig-Holstein. Based on the material dating from the earliest times to the Viking period, Bender Jørgensen suggested a typology focusing on regional and chronological peculiarities. Soon after, in 1992, she expanded this work to adjacent countries, including most parts of Germany. In 2005, a description of over 200 Hallstatt and La Tène textiles followed, covering Central Europe and including only a few finds that had previously been catalogued by other scholars. Twenty-five of these textiles were from Germany, *i.e.* from Rheinland-Pfalz and Bayern. Furthermore, Bender Jørgensen compared her own results not only to those achieved by Hans-Jürgen Hundt, but also to the more recent work carried out by Katharina von Kurzynski (1996) and Johanna Banck-Burgess (1999).

Katharina von Kurzynski published the

Celtic textiles in 1996, relying on previously published material and her own examinations. Her focus was on the sites of Hallstatt and Dürrnberg in Austria, but altogether the catalogue contained some 160 sites from Central Europe and Great Britain, spanning from Ha C/D to La Tène. Besides the archaeological items, iconographic as well as written evidence play a great role in von Kurzynski's work.

The same time span but a partly different area, including northern Germany and parts of Poland, was covered by Johanna Banck-Burgess (1999), who took more than 230 sites into consideration. This material constituted the background for the discussion of textiles found in the princely grave of Eberdingen-Hochdorf in Baden-Württemberg, focusing on their function in the graves (*cf.* Banck-Burgess in this volume).

Karina Grömer (2007) dealt with the Bronze Age textiles from the salt mines in Austria, including their technical aspects as well as functions, but also considered contemporary material from Germany and other neighbouring countries in her catalogue.

Textiles from Schleswig-Holstein were reinvestigated by Solveig Ehlers (1998b), who included much hitherto unpublished material. Ehlers compared these finds to textiles from neighbouring regions north and south. Ehlers' aim was to take microstratigraphy and context into account and thus to determine the textile functions.

Apart from the above-mentioned comprehensive works, there is only little new or re-examined material that may be added for consideration here. Heidemarie Farke (1991; 1993), Regina Scherping (Scherping and Schmidt 2007) and Antja Bartel (together with Helmut Voß 2005) published very interesting Bronze Age finds from East Germany and Bayern respectively. Furthermore, Solveig Ehlers (Nortmann and Ehlers 1995) and the present author (Möller-Wiering 2006–07) have investigated some Iron Age burials in Rheinland-Pfalz.

Raw Materials

In her book on prehistoric textiles of Europe, Egypt and the Near East, Elizabeth J. W. Barber proposed four zones of textile traditions for the time up to *c.* 2000 BC (1991, 250), *i.e.*

mainly before the beginning of the Bronze Age in Central Europe. Germany belonged to the broad north-western zone stretching from Anatolia to Denmark, which was characterised by, amongst other features, the use of bast fibres like flax, as well as wool, as raw materials (Barber 1991, 253). A few Neolithic finds may be mentioned in this context. Firstly, there are some linen tabbies from Hornstaad on Lake Constance and Wangen near the Swiss border, dated to the first half of the 4th millennium BC (Körber-Grohne 1990, 11; Müller 1994, 27, 31). Another item is a Late Neolithic tabby excavated in Latdorf 'Spitzes Hoch', Sachsen-Anhalt, which was noted by Emil Vogt as linen (1937, 43).⁵ Furthermore, there are Late Neolithic tabby fragments from Dittfurt 'Kreienkopp', Sachsen-Anhalt, determined by Karl Schlabow (1959, 115) as made from long wool fibres, which should also apply to the 'Spitzes Hoch' textile (Schlabow 1959, 113; 1972, 6). Later, the finds from both sites were re-examined by different scholars, who described them all as plant material, probably linen (Bender Jørgensen 1992, 51).⁶ Finally, a possible tabby from Wiepenkathen, Niedersachsen, has one thread system of s-twisted animal hair while the other, now decayed system was probably woven from plant fibres.⁷ According to Lise Bender Jørgensen (1992, 51, 224), it is dated to the Late Neolithic (*c.* 2400 BC), while Solveig Ehlers (1998b, 252) places it in the transition between the Neolithic and Bronze Age (*c.* 2000 BC).

Another ancient piece of wool is an Early Bronze Age item found in Unterteutschental, Sachsen-Anhalt (Schlabow 1959, 118–120). It was discovered together with a piece of a band of which only one thread system had survived. This was made of wool, while the other was interpreted as linen which had disintegrated. The extent to which linen was used remains open to question for the different regions and periods. In 1972, Karl Schlabow considered this issue but did not mention any purely linen or other plant items from central or southern Germany. Hans-Jürgen Hundt reported on a linen rep from Straubing-Ortler, Bayern, dated to Bz A (1974, 49).⁸ Furthermore, he identified one system of a tabby found in Steinheim, Hessen, as linen, the other as wool. This fragment is dated to Bz D (Hundt 1988, 261).⁹ A linen plied thread in S2z is reported from one of the caves near Bad Frankenhausen,

Sachsen-Anhalt, as belonging to the Late Bronze Age (Farke 1991, 125–126). The few finds presented so far extend the use of wool and linen in Germany to the period after 2000 BC. Thus, Elizabeth Barber's suggestion of a "wool-and-linen zone" (1991, 250) makes more sense for Germany when the Bronze Age is included, as Barber's original suggestion was for the Neolithic where the evidence of wool in Germany is weak.

The only Bronze Age linen weave known for northern Germany is a tabby dated to Period V, found at Schaliß, Mecklenburg-Vorpommern (Ehlers 1998b, 221).¹⁰ Based on palaeobotanical evidence, Ehlers claimed that flax and hemp as cultivated plants did not reach the northernmost areas of the country until the Pre-Roman Iron Age (Ehlers 1998b, 231). Friedrich Just described a linen tabby from *c.* 500 BC, found in Mühlen-Eichsen, Mecklenburg-Vorpommern (1964, 311). The only Pre-Roman textile determined as linen mentioned by Karl Schlabow was a tabby found in Weyhausen, Niedersachsen, dated to the 4th or 3rd century BC (1972, 19).

The vast majority of the preserved textiles are made of sheep wool. Already when Johanna Mestorf published Bronze Age material in 1875, she suggested that sometimes, wool was mixed with grass-like fibres, perhaps flax (Mestorf 1875, 203). Fourteen years later, Georg Buschan (1889, 27–28) determined the material of certain Bronze Age textiles based on chemical and microscopic investigations as unsorted sheep wool, *i.e.* fine underwool in combination with stiff kemp hair. At about the same time, Bille Gram (1891, 116) in Denmark determined the very coarse hairs amongst the fibres as some sort of deer hair; based on this, many scholars in Germany and elsewhere considered the stiff hairs to be an admixture of deer/roe or cattle hair (*e.g.* Girke 1922, 33; Broholm and Hald 1935, 294; Schlabow 1937, 22; von Stokar 1938, 50–52). This opinion was questioned by Agnes Geijer in 1937 in favour of pure sheep wool, while her co-author, Hjalmar Ljungh, claimed that the textiles containing these stiff hairs were made solely from roe hair (Geijer and Ljungh 1937, 266–270). Soon after this, the admixture of non-sheep hair was disproved by Carl Steenberg (1939, 37–38) and Karl Schlabow (1939, 121), confirming Buschan's results (*cf.* Mannering *et al.* in this volume). More recently however, Heidemarie

Farke (1993, 109–110) identified thick hairs again as a roe hair admixture to sheep wool.

Sporadically, other textile materials than wool and flax have been identified, *e.g.* horsehair (Ehlers 1998b, 230–231), tree bast (Bartel and Voß 2005, 45), Old man's beard (*Clematis vitalba* L.; Farke 1991), bronze (Hundt 1995; Farke 1993, 111) and gold (Banck-Burgess 1999, 204). These were used for decoration, sewing and plaiting, rather than for weaving, the exceptions being hemp and badger hair in Eberdingen-Hochdorf and gold in Asperg (Banck-Burgess 1999, 82–83, 125, 204 and in this volume). An unusual non-woven item is a small saddle found in a grave with a little chariot in Kemmathen, Bayern dated to Ha D (Spoletschnik and Bartel 1997, 99). The material was not identified but described as felt-like, in combination with tree bast and fur. Possible felt may furthermore be mentioned for Behringen, Niedersachsen, dated to Period V (von Stokar 1938, 98).

Some controversy exists regarding the use of silk in Pre-Roman Germany. Regina Scherping interpreted heavily corroded threads, or rather, imprints on a bronze collar from the woman's grave discovered in Thürkow in Mecklenburg-Vorpommern, dated to Period III, 1300–1100 BC as silk (Scherping and Schmidt 2007, 208, 215).¹¹ Decorative threads in a textile from Hohmichele were described as probable silk by Hans-Jürgen Hundt (1969, 63). Based on the analysis of amino acids, Johanna Banck-Burgess (1999, 234–235) rejected the determination as silk in favour of plant material for the sites of Hohmichele as well as Eberdingen-Hochdorf (Banck-Burgess 1999, 128; this volume). However, Banck-Burgess did not consider an investigation by Irene Good (1995, 966) who, again based on amino acids, confirmed the determination for Hohmichele as silk.

Evidence of dyeing is extremely rare, both in the Bronze Age and the Pre-Roman Iron Age. The earliest proof of dyeing is provided by some red threads found in a cave near Bad Frankenhausen, Sachsen-Anhalt, dated to the Late Bronze Age (Farke 1991, 128–129, 132). The fibres are plant, probably Old man's beard (*Clematis vitalba*). A 2/2 twill from a bog near Damendorf, Schleswig-Holstein, excavated in 1934, consists of variously coloured warp and weft, one of which is supposed to be dyed (Schlabow 1938, 119).¹² With the help of

palynology, they were dated to the Early Iron Age (Tidelski 1938, 114).¹³ Several dyes were detected in the material from Eberdingen-Hochdorf (Walton Rogers 1999, 242; Banck-Burgess in this volume). Red and blue dyes were found among the textiles from Hohmichele (Walton Rogers 1999, 246). Blue dye is also known from a textile found in a grave at Grabenstetten, Baden-Württemberg, dated to the Hallstatt period (Banck-Burgess 1999, 86, 204). Additional material consists of a possibly linen tabby with blue stripes, which was found in a grave from Lt A in Reinheim, Saarland (Keller 1965, 19).

Tools and Techniques

Raw fibres were prepared in specific ways and then spun before being used for weaving or other production methods for larger textiles. Neolithic spindle whorls are known from Bodman in Baden-Württemberg and Rössen in Sachsen-Anhalt for example (La Baume 1955, 32, Abb. 16). Bronze Age whorls were found in rock shelter or abri Mühlthal I, Niedersachsen (Grote 1994, 149), and in eastern Germany (Krabath *et al.* 2007, 22). As far as the Hallstatt and La Tène periods are concerned, spindle whorls were excavated in many settlements, for example, in Altdorf and Burgweinting, both in Bayern (Engelhardt *et al.* 1992, 87; Dallmeier and Froschauer 1996, 74).

In the north of Germany, a few spindle whorls occur in the Late Bronze Age, mostly in settlements, with only one found in a grave (Ehlers 1998b, Karte 11). Yet, Solveig Ehlers noted that the yarns of Bronze Age fabrics are very heterogeneous in thickness and twist angle, which might suggest the use of a spinning hook, while whorls were introduced only during the Late Bronze Age (Ehlers 1998b, 283). Another possibility is a wooden spindle with an integrated weight, *i.e.* without a separate whorl. There are no examples of such tools from Germany, but an Early Iron Age wooden spindle with an integrated weight has been found at Hjortspring in Denmark (*e.g.* La Baume 1955, 117; *cf.* Mannering *et al.* in this volume). For the Pre-Roman Iron Age, whorls from several sites in Niedersachsen have been reported (Althoff 1992, 138–139).

The main interest of scholars studying archaeological textiles during the first half of the 20th century was not in the products

themselves but in the looms and their technical details from the Stone Age onwards. The discussion focused on the existence and distribution of the warp-weighted loom. When Hugo Jentsch, as early as 1889, excavated some Iron Age loom weights lying in two rows, he was already aware of the function of these items (1889, 6). Yet, until the 1930s, the possibility of the use of the warp-weighted loom during the German Bronze and Iron Age was rejected by some scholars in favour of different variations of an upright two-beam loom. Particularly the theory of von Kimakowicz-Winnicki (1910, 50) inspired various researchers (see Rosenfeld 1958, 61–62). Albert Kieckbusch however, was convinced of the antiquity of the warp-weighted loom, because he had excavated the Late Bronze Age settlement of Buch in Berlin that included a weaving pit with a number of weights (1923, 60–62). In 1928, Emelie von Walterstorff presented contemporary fabrics from northern Norway, woven on a warp-weighted loom and characterised by firm starting borders, which then became generally interpreted as a specific feature of the warp-weighted loom.¹⁴ Based on some experiments, Karl Schlabow tried to prove the existence of this loom in the Bronze Age (1937, 28–29). Other works in this tradition, favouring the warp-weighted loom as the main weaving tool, were published by Wolfgang La Baume (1955, 69) and Hans-Friedrich Rosenfeld (1958, 98ff). While the use of the warp-weighted loom both in the Bronze Age and the Iron Age seems to be widely accepted at present, – it is *e.g.* a characteristic feature of Elizabeth Barber's aforementioned north-western textile zone (1991, 250), – it was questioned again by Josef Winiger in 1995, in connection with the Neolithic as well as later twill production (1995, 143, 182–183).

At least for the final phases of the Bronze Age, the use of the warp-weighted loom is substantiated by the presence of loom weights, sometimes found in narrow pits interpreted as weaving pits. The latter were as long as the looms, but their narrow width only provided room for the loom weights, while the weaver had to stand outside the pit while weaving. Weights were found at different sites in Bayern (*e.g.* Schmotz 1988; Geck and Seliger 1990, 49; Nadler and Pfauth 1992, 58; Dallmeier and Froschauer 1996, 74) and Sachsen (Bönisch 2007, 29ff; Krabath *et al.* 2007, 21). For the

regions further north, the above-mentioned site of Buch in Berlin (Kieckbusch 1923, 60–62) and a Late Bronze Age weaving pit in Wallwitz, Sachsen-Anhalt (Stahlhofen 1978), may be noted.¹⁵ Apart from the tools, some textiles also indicate the use of the warp-weighted loom. The Neolithic pieces from Latdorf und Dittfurt, Sachsen-Anhalt, mentioned above, have possible starting borders. They were interpreted as such by Karl Schlabow (1959, 107–108, 115), but this has later been questioned by others (Hoffmann 1974, 164; Winiger 1995, 143). The oldest tablet-woven starting border was identified by Heidemarie Farke (1993, 111) on a tabby from Schwarza, Thüringen, dated to Bz C, although Karl Schlabow (1958, 30) considered this border as band-woven.¹⁶ An important find in this context is a square tablet made of bone, measuring 3.5 by 3.7 cm and with a hole in each corner, which would have been suitable for making tablet-woven starting borders. Together with the previously mentioned spindle whorl, it was found in abri Mühlthal I, Niedersachsen, and is dated to the Late Bronze Age (Fig. 4.1; Grote 1994, 149). It is thus the oldest example of its kind in Germany.

Hardly any tools are known from the Scandinavian-influenced north of Germany. Only five sites scattered over the entire region dated to the Late Bronze Age yielded loom weights (Ehlers 1998b, Karte 11).¹⁷ The Pre-Roman Iron Age is represented by some finds from various sites in Niedersachsen (Althoff 1992, 139). In the very north of Germany, loom weights became common only during the Roman Iron Age (Ehlers 1998b, 248). Correspondingly, starting borders are also rare.¹⁸ Based on the Bronze and Iron Age textiles which remained much alike in the north over a very long time period, Solveig Ehlers argued that the loom remained the same during the Bronze Age, but that this was probably not the warp-weighted loom (Ehlers 1998b, 283). Ehlers also pointed out the presence of the irregular warp threads which are neither twisted sufficiently hard nor plied and, thus, probably are unsuitable for the warp-weighted loom (Ehlers 1998b, 262). Instead, Ehlers supported the idea of a tubular-warped loom with two or three beams. Lise Bender Jørgensen, on the other hand, proposed a still unknown type of loom suitable for weaving wool, bridging the gap between the warp-weighted loom used in the south for flax already in the Neolithic period, and the loom

with a tubular warp of the northern Iron Age (1992, 118–119). The textiles found so far do not have any details that can help answer this question. The typical features of tubular-woven textiles, *i.e.*, actual tubular pieces with warp locks, as well as closed loops at the end of the warp (*cf.* Mannering *et al.* in this volume), are lacking among the German finds.

Possible weaving swords made of wood were found in Fellbach-Schmieden, Baden-Württemberg, and in Porz-Lind, Nordrhein-Westfalen; both belong to the Late La Tène period (von Kurzynski 1996, 14–15).

Another early technique for making textiles is sprang, characterised by only one system of threads which are individually crossed. The tools needed for producing sprang, namely smooth sticks, are neither likely to be preserved nor to be recognised as such. Therefore, it is only the products themselves that can prove the existence of this technique. Karl Schlabow described sprang already for the Neolithic period, as attested by imprints of a sprang textile on sherds from Rietzmeck, Sachsen-Anhalt (1960, 51–52; *cf.* Zeiere in this volume). This identification was questioned by Lise Bender Jørgensen (1992, 51), who considered the imprints the possible results of a decorating tool. However, a piece that could be sprang was also reported from the Neolithic site of Pestenacker, Bayern (Bartel and Schönfeld 2004, 36). From the Bronze Age (Period III), two examples of sprang came to light, in Harsislee, Schleswig-Holstein (Ehlers 1998b, 269), and in Thürkow, Mecklenburg-Vorpommern (Scherping and Schmidt 2007, 215).

The latter site also provided a border made in needlework (Scherping and Schmidt 2007, 215). In Flintbek, Schleswig-Holstein, a textile with some needlework was preserved in a woman's grave dated to Period II (Ehlers 1998b, 165). To the Late Bronze Age belongs embroidery with applied beads from Grundfeld, Bayern (Bartel and Voß 2005, 45). An Early La Tène bronze sewing needle with fragments of a sewing thread is known from Kemathen, Bayern (Rieder 1990, 68).

Bronze Age

For the textiles found in Germany, Lise Bender Jørgensen (1992, 51–53, 224–226) proposed a division of three geographical groups.

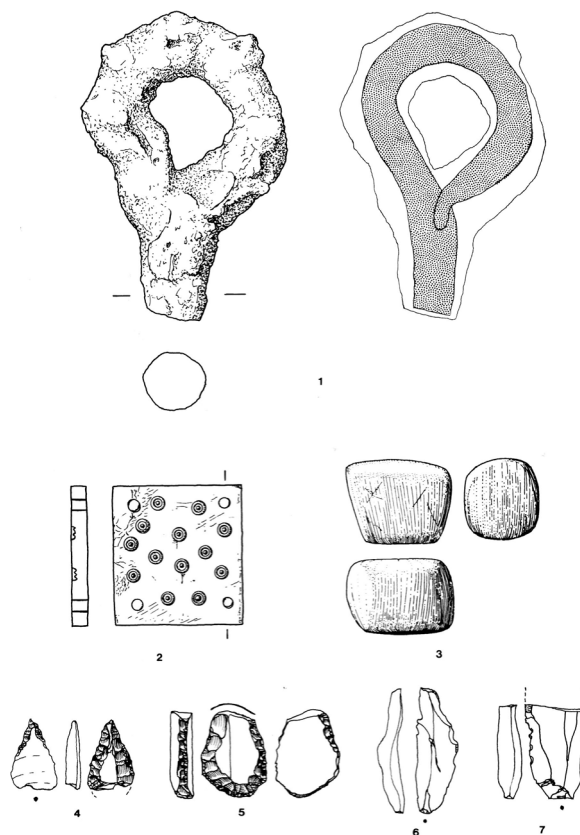


Fig. 4.1. Square tablet of bone from abri Mühlthal I, Niedersachsen, dated to the Late Bronze Age (Drawing: After Grote 1994, 105, Tafel 101, 2).

Her 'South German group' comprised three sites in Hessen and Bayern, to which one in Nordrhein-Westfalen may be added. Two sites in Sachsen-Anhalt and Thüringen constitute her 'Central German group', which means this group covers eastern rather than central Germany. The majority belong to the 'North German group', which originally included finds from a few sites in Niedersachsen and Mecklenburg-Vorpommern. Textiles from Schleswig-Holstein were described in Bender Jørgensen's volume dealing with north European textiles that was published in 1986. As mentioned above, Schleswig-Holstein, north-east Niedersachsen and Mecklenburg-Vorpommern were reinvestigated by Solveig Ehlers (1998b), who examined and added approximately 100 pieces. Here, all textiles from Schleswig-Holstein are incorporated into the 'North German group'.

The oldest piece of the 'South German group' belongs to Bz A and was found in Straubing-Ortler, Bayern (Hundt 1958b, 26; 1974, 49). It is a rep-like tabby with z-twisted and S-plied threads in both systems, while a piece from Behringsdorf (Bz D), also

in Bayern, was made with a Z2s/Z2s yarn combination (Hundt 1971, 115; 1974, 49). Both are considered to be linen. A tabby band from Steinheim, Hessen (Bz D), consists of S-plied yarns in one system combined with Z-plied threads in the other (Hundt 1969–70, 257–258; 1971, 115; 1974, 49; 1988, 261).¹⁹ The material is flax and wool. Of a later date (Ha B) is a possibly linen 2/2 twill from Gevelinghausen, Nordrhein-Westfalen (Hundt 1969–70, 258; 1974, 48).²⁰ It is woven in S2z/S2z yarn, with 14/12 threads/cm. Seemingly, the only find without plied yarn is the Late Bronze Age tabby in z/s, decorated with beads, from Grundfeld, Bayern (Bartel and Voß 2005, 45). It might be added, though, that the woman's dress itself was deteriorated and only imprints of textiles remain.

The textiles from the 'Central German group' also come from only very few sites, but the material is very varied. The earliest woven band, from the Early Bronze Age, was found in Unterteutschental, Sachsen-Anhalt. Both systems are s-twisted, with 9/4.5 threads/cm. While the wool warp is well preserved, unfortunately, very little remains of the weft, which is believed to have been made of flax (von Stokar 1938, 54; Schlabow 1959, 118–119). Another item from Unterteutschental is a wool rep in Z2s/Z2s, with c. 10/5 threads/cm (Schlabow 1959, 119–120). S-twisted yarns and in one case Z-plied threads for a weft are also known from Middle Bronze Age graves in Dietzhausen, Thüringen (Farke 1993, 109–111). They constitute two reps with up to 8/36 threads/cm. One coarse tabby is made of wool and, according to Heidemarie Farke (1993), some roe hair in the weft. Graves in Schwarza, also in Thüringen, dated to Bz C, contained several wool tabbies, mostly in s/s, but some in Z2s/Z2s-plied yarns (Schlabow 1958, 29–33; Hundt 1958a, 37; Farke 1993, 111). They present three different structures: closely woven and fulled pieces and open, veil-like fabrics, both with single yarns and a thread count lower than 10, as well as reps with plied yarns and a higher thread count. One of the fulled textiles possibly has a starting border, which was either band-woven (Schlabow 1958), or tablet-woven (Farke 1993). If the latter is the case, it would be the oldest example of tablet weave in Europe. A rep made from z-twisted yarns, probably wool, and with 18/6 threads/cm was brought

to light from a Late Bronze Age cave near Bad Frankenhausen, Sachsen-Anhalt (Farke 1991, 134–135). Some cords found there are dyed red (Farke 1991, 128–129, 132), constituting the earliest instance of dyeing in Germany (*cf.* Grömer in this volume).

The 'North German group' is characterised by tabby weave throughout the entire Bronze Age, although textiles from Period IV onwards are very few (Ehlers 1998a; 1998b, 278–279). In most cases, s-twisted yarn in one system is combined with z-twisted yarn in the other, but s/s is not rare, either. A typical thread count is of only 4–6 threads/cm, while some pieces, emerging already in Period I, have up to 20 threads/cm. A rep-woven band with s-twisted warp, Z2s-plied weft and 18/5 threads/cm was found in Schöningstedt, Schleswig-Holstein, dated to Period III (Ehlers 1998b, 470). The first 2/2 twill is dated to Period V (Ehlers 1998b, 272). It has s-twisted yarn in both systems and was found in Dehnsen, Niedersachsen, adhering to an iron knife (Krüger 1924, 70–71). Another unusual find is a broken or probably a diamond twill with 17.5/14.5 threads/cm, excavated in Nebel, close to the Danish border, dated to Period VI. It is made of S-plied yarns in both systems (Ehlers 1998b, 273), which is not typical for the north and might point towards the fabric as an import (Ehlers 1998b, 275).

Besides woven textiles, sprang is known from Period III, represented by finds from Harrislee on the Danish border and from Thürkow, Mecklenburg-Vorpommern. While the former was manufactured from s-twisted wool (Ehlers 1998b, 269), the latter is said to be made of silk (Scherping and Schmidt 2007, 125). Moreover, the grave from Thürkow contained a wool border executed in needlework. Somewhat older is a blouse or tunic which was excavated in Flintbek in Schleswig-Holstein, from Period II. Its neck opening is also decorated in needlework (Ehlers 1998b, 267). Both borders are closely related to the Danish finds of Skrydstrup and Melhøj (*cf.* Mannering *et al.* in this volume). Tablet-woven pieces have as yet not been recovered. Finally, a piece of felt was found at Behringen, Niedersachsen, dated to Period V (von Stokar 1938, 98).

Pre-Roman Iron Age

As for the Bronze Age, Lise Bender Jørgensen (1992, 53–56, 226–228) divided the Pre-Roman

Iron Age textiles into three groups, the 'South German group' with finds from Bayern, Baden-Württemberg, Rheinland-Pfalz and Hessen; the 'Central German group' covering Sachsen, Sachsen-Anhalt and Thüringen (again rather eastern than central Germany); and the 'North German group' with material from Niedersachsen, Mecklenburg-Vorpommern, Brandenburg and Nordrhein-Westfalen. As before, Schleswig-Holstein was considered by Bender Jørgensen as part of Scandinavia and thus treated in her publication of 1986, but is integrated in the 'North German group' in this study.

The 'South German group' covered the area of the Late Hallstatt and La Tène culture including the Hunsrück-Eifel culture. The majority of the textiles belong to Ha C and D, with very few pieces dated to Ha D/Lt A. Much of this material was analysed and originally published by Hans-Jürgen Hundt, while other sites were added later by Lise Bender Jørgensen (2005, 147–148). The site of Eberdingen-Hochdorf in Baden-Württemberg is presented by Johanna Banck-Burgess elsewhere in this volume and therefore is not considered here. Typical for the 'South German group' are wool 2/2 twills with S2z-plied warp and z-twisted weft, with varying thread counts. The same twist combination was used in a plant fibre tabby from Hügelsheim, Baden-Württemberg (Hundt 1981, 309). Wool twills with S-plied yarn in both systems were found in several graves in Bescheid, Rheinland-Pfalz (Hundt 1993, 137–138). A grave in Odernheim, Rheinland-Pfalz, and another one in Beilngries, Bayern, both contained a spin-patterned 2/2 twill with S2z plied yarn in one system, but groups of either z- or s-twisted yarns in the other system (Hundt 1987, 273; Bender Jørgensen 2005, 148). Among the twills with non-plied yarn, a spin-patterned variant from Worms-Herrnsheim, Rheinland-Pfalz, deserves mention (Hundt 1971, 114), as well as one item in z/z from Uffing, Bayern (Bender Jørgensen 2005, 148), and finally one in s/s from Hohmichele, Baden-Württemberg (Hundt 1962, 209).

Plied yarns (S2z) in both systems are seen in a wool rep from Bescheid, Rheinland-Pfalz (Hundt 1993, 138),²¹ as well as in a possibly linen tabby from Bastheim, Bayern (Hundt 1963, 183–184; Bender Jørgensen 2005, 148)²² and in fragments from Hohmichele. The latter

include a woven pattern with threads made of another material than wool, which constitutes the main part of the fabric.²³ The tabbies with single yarn were produced as either z/z or s/s, some of the latter being described as veil-like wool pieces.²⁴ A gold thread was used in the weft of a tabby belt found in Asperg, Baden-Württemberg (Banck-Burgess 1999, 204). Besides Eberdingen-Hochdorf and Hohmichele, a tablet-woven starting border is reported from Bescheid, Rheinland-Pfalz (Banck-Burgess 1999, 199; Bender Jørgensen 2005, 148).

Compared to the Hallstatt period, including the transition to La Tène A, the corpus of La Tène textiles is even smaller. The twills in S2z/z-twisted yarn were still produced. Examples are known from Höresham, Bayern (Hundt 1971, 116), and from three sites in Rheinland-Pfalz (Nortmann and Ehlers 1995, 127; Hundt 1993, 141; Bender Jørgensen 2005, 147–148). The site of Höresham also yielded a 2/2 twill with S-plied threads in both systems (Hundt 1971, 116), and a similar piece was found in Wallscheid, Rheinland-Pfalz (Haffner 1976, 216).²⁵ A probable 2/2 twill in z/z, *i.e.* with single yarns in both systems, was recorded at the site of Riekofen, Bayern (Bender Jørgensen 2005, 148). Particularly well documented is the material from Pellingen, Rheinland-Pfalz, where the barrows contained at least four types of weave (Nortmann and Ehlers 1995, 119–120). One is a 2/2 twill woven with single yarns but spin-patterned in both directions. The other three are tabbies: S2z/z in wool, S2z/S2z in wool and z/z in linen. The last of these tabby variations is also known from Hoppstädten (Möller-Wiering 2006–07, 14),²⁶ while the first type is known from some other sites in Rheinland-Pfalz (Bender Jørgensen 2005, 147–148).²⁷ Breungenborn in Rheinland-Pfalz additionally provided a wool tabby in z/z, a type which was also found in Uelversheim, Rheinland-Pfalz (Bender Jørgensen 2005, 147), and on two Bavarian sites, Schwenderöd and Triftfling (Osterhaus 1982, 227; Bender Jørgensen 2005, 148). The Late La Tène period is represented by only one well-documented piece, as far as the 'South German group' is concerned. It is a 2/2 twill in z/z from Konz-Filzen, Rheinland-Pfalz (Haffner 1974, 53). Apart from these weaves, one possible tablet weave from Udenheim (Lt B/D) and one possible sprang from Irsch (HEK), both in

Fig. 4.2. Wool textile with a rep-like starting border from Kiebitz Moor, dated to c. 50 BC (Photo: After Hayen and Tidow 1982, 30, Abb. 2).



Rheinland-Pfalz, can be mentioned (Bender Jørgensen 2005, 147–148).

As is the case with the Bronze Age material, the finds belonging to the ‘Central German group’ are very diverse. A tabby with probably s-twisted yarn in both directions and 10/12 threads/cm was preserved in an Early La Tène grave in Heidenau, Sachsen (Coblenz 1964, 96–97). A Late La Tène tabby in z/z with 8/8 threads/cm comes from Bornitz, Sachsen-Anhalt (Bender Jørgensen 1992, 227). Also from the Late La Tène period is an extremely fine, probably plant fibre tabby with 20–25/25–30 threads/cm, found in Gräfenhainichen in Thüringen (Gustavs and Gustavs 1975, 125–126). The twist direction is not stated. Only “Early Iron Age” is given as the dating for a 2/2 twill in z/Z2s with 10/11 threads/cm, found in Wretleben, Sachsen-Anhalt (Bender Jørgensen 1992, 227). Culturally, most of this area belonged to the Jastorf culture, *i.e.* to the north, at least as far as the later phases are concerned.

The ‘North German group’ (Bender Jørgensen 1992, 53–54, 226–227) is mostly connected with the Jastorf culture (see also Bender Jørgensen 1986, 229–231). The majority of textiles are open, veil-like tabbies (*Schleiergewebe*) made from z-twisted yarn with 10–18 threads per cm. The raw material, probably flax, is only

mentioned in two cases. They were found in cremation graves. A few other, less open tabbies were also made from z-twisted yarn. Amongst these an Early Iron Age piece from Boostedt, Schleswig-Holstein (Ehlers 1998b, 480), a very coarse extended tabby (basket weave) from Damendorf (1884), Schleswig-Holstein, from around 400 cal BC (Schlabow 1976, 83–84; van der Plicht *et al.* 2004, 485) and the already mentioned wool textile with a rep-like starting border from Kiebitz Moor, dated to c. 50 BC (Fig. 4.2; Hayen and Tidow 1982, 29–31). The latter might be seen in context with the material from Feddersen Wierde, a settlement on the coast of Niedersachsen. The oldest phase of this site is dated to the Pre-Roman Iron Age, beginning c. 50 BC. Seven out of 13 textiles found there – all wool – may be described as tabbies in z/z. The other fabrics are a tabby in z/s, a tabby in z/S2z and several 2/2 twills in z/z.

Four sites with 2/2 twills are known from Schleswig-Holstein. One of them is again the bog near Damendorf. Besides the basket weave and a skin, a bog body was found in 1884 with an extended twill in z/zz, *i.e.* one thread system is paired (Schlabow 1976, 84). The weave with 7.5/7.5 threads/cm has a tubular selvedge. At the same site, the body of a young girl was found in 1934 together with a skirt, another

piece of textile and again a skin cape (Schlabow 1938; 1976, 5–6). The textiles are coarse twills in z/z with maximum 8/8 threads/cm. One of them has a tubular selvedge. These twills are similar to a fragment from Nieblum (Bender Jørgensen 1986, 230). A 2/2 twill from Almdorf is quite different, with s-twist in one system and z-twist in the other and with 17/14 threads/cm (Bender Jørgensen 1986, 231). Further south, a broken or diamond twill in z/z with 15/12 threads/cm was found in a grave at Sonnenberg, Brandenburg, and belongs to the Jastorf culture (Bender Jørgensen 1992, 227). Two other textiles of the ‘North German group’ come from graves showing connections to the south, which is also reflected in the yarn, *i.e.* in the use of z-twisted and S-plied yarns. One is a Ha D/ Lt A linen 2/2 twill from Luttm, Niedersachsen, with 9/7 threads/cm (Bender Jørgensen 1992, 227). The other one is from Döhren, on the northern border of Nordrhein-Westfalen, a wool tabby with 14.5/7.5 threads/cm, dated to the 5th century BC (Tidow 1981, 72–73).²⁸

Textile Function

In many cases, the function of the preserved textiles is unknown. When indications of the original function are present, it is possible to distinguish between primary and secondary use, but even this is often not unambiguous. The context in which the textiles were found allows four categories of textile use to be recognised. These are described here by giving a few examples for each category.

The largest group encompasses funerary textiles, which are known from inhumations as well as cremation graves. Funerary textiles, however, are not restricted to coverings or wrappings of the dead or of the cremated remains. Often, smaller or larger objects included with the deceased – weapons, jewellery, serving dishes, chariots *etc.* – are also wrapped in textiles, as are, sometimes, the urns (*cf.* Gleba in this volume). Utilitarian textiles such as wall hangings and floor coverings also belong to this group. The most completely preserved examples come from the princely grave of Eberdingen-Hochdorf, dated to Ha D (Banck-Burgess 1999, 18–32, 97–126 and in this volume). For the north German Bronze Age, Solveig Ehlers presented a few funerary textiles (1998b, 205, 207). For the Iron Age of

the same area, the veil-like tabbies can perhaps be interpreted as special weaves for the dead (Banck-Burgess 1999, 34).

The second category comprises garments, of which only very little is known. Fragments of a blouse comparable to the Danish Bronze Age finds (*cf.* Mannering *et al.* in this volume) came to light in Quelkhorn, Niedersachsen (Hägg 1996, 233–235). Bronze Age women buried in Flintbek, Schleswig-Holstein (Period II; Ehlers 1998b, 165), and Thürkow, Mecklenburg-Vorpommern (Scherping and Schmidt 2007, 215), were attired in fabrics decorated with needlework, probably also blouses. A woman living in the Late Bronze Age and buried in Grundfeld, Bayern, was clothed in an embroidered collar, in this case decorated with small beads (Bartel and Voß 2005, 45–46). Around her hips, she had a woven belt. A short wool skirt came to light together with the Early Iron Age bog body from Damendorf, Schleswig-Holstein (Schlabow 1938, 114–119; 1976, 96). Only a few of the textiles found in Eberdingen-Hochdorf were determined to be clothing (Banck-Burgess 1999, 84–85, and in this volume), mainly the checked twills.

A few textiles belong to a third category, which served various other purposes. One example is the small saddle found in Kemmathen, Bayern, dated to Ha D, which was made of a felt-like fabric and other organic materials (Spolettschnik and Bartel 1997, 99). Textile was sometimes used in the construction of sword scabbards, either as lining or as part of the outer covers (Ehlers 1998b, 206; *cf.* Grömer in this volume). The latter is not only documented for the Bronze Age in the northern part of the country, but also known from a Ha C sheath from Bastheim, Bayern (Hundt 1963, 183).

Finally, sacrifices or offerings may be mentioned (Möller Wiering 2011). The Bronze Age finds from the caves near Bad Frankenhausen, Sachsen-Anhalt, represent a prominent example of offerings including textile material (Farke 1991, 140). Some Late Bronze Age loom weights in Untermassing, Bayern, were also interpreted by the excavators as possible offerings (Nadler and Pfauth 1992, 58).

Conclusions

Both flax and wool textiles are known in

Germany from the Neolithic period onwards. Regional and chronological differences are primarily due to different conditions of preservation. In the beginning of the 20th century, the thick, stiff fibres observed in Bronze Age wool were described as deer or cattle hair until it was realised that they are the kemp fibres of primitive sheep. Materials other than flax and wool are rare, and are mainly used for decoration, sewing and plaiting. Dyeing is only known from a few sites, primarily the princely burials of the Hallstatt culture.

The Bronze Age material from southern Germany is characterised by tabbies with plied yarns in both thread systems. The first twill, again with plied yarns and with 14/12 threads/cm, appears in Ha B. Noteworthy is a woman's garment with sewn-on beads. Central, or rather, eastern Germany provides tabbies of various kinds, most often in s/s and a thread count of 5–10, but also reveals the use of plied yarns in one or both systems and higher thread counts. Of special interest are a red-dyed thread and a possible starting border, perhaps tablet-woven. Typical for the north are tabbies with a low thread count of 4–6 threads/cm, mostly in z/s, others in s/s. Two weaves with a higher thread count have plied yarns in at least one system, thus indicating a southern origin. Sprang and needlework are known, as well as, possibly, twill.

In general, the thread count is higher in the Iron Age material than in the Bronze Age. The typical weave in southern Germany is a 2/2 twill with S-plied warp and z-twisted weft. Fabrics with only single yarns, either tabby or twill, are few. A great variety of rare or unique fabrics including spin-patterned textiles was found in princely burials. The textiles from central or eastern Germany are too few and too varied to permit any generalisations. As in the Bronze Age, some features indicate a southern influence while others rather point northwards. Typical for northern Germany are tabbies in z/z. Tabbies with other twist combinations are only known from the very end of the Pre-Roman Iron Age. The twills are also made mostly in z/z.

Spindle whorls, loom weights and starting borders – the two latter typical features of the warp-weighted loom – are known from the Bronze and Iron Ages in all parts of the country, although the distribution is very variable regionally and chronologically.

Whether or not other tools for spinning and weaving were in use during the Bronze Age in the north is a subject of debate. Besides weaving, sprang was produced from very early times onwards. Felt seems to have been used from at least the Iron Age.

Although the corpus of Bronze Age and Pre-Roman Iron Age textiles in Germany encompasses several hundred fragments, the distribution is so variable that it is still impossible to provide a coherent overview for all regions and periods. Hardly any fabrics are known from western and central Germany. Bronze Age finds are also underrepresented in the south, as is the Iron Age in the east and the north. Growing interest in textiles, increasing awareness of textiles during excavations and improved methods of conservation will hopefully reduce the gaps in the future.

Notes

- 1 The term 'Pre-Roman Iron Age' generally refers only to Northern Europe while further south, more specific definitions are used, according to region, culture and period (see below). Since this chapter deals with the entire country, it seems useful to confine ourselves to one term when speaking in general. In this sense, the 'Pre-Roman Iron Age' is used for Germany as a whole.
- 2 These are Kayhausen and Jühdenerfeld (*i.e.* Bockhornerfeld) in Niedersachsen, Damendorf (finds of 1884 and 1934) and Röst in Schleswig-Holstein (van der Sanden 1995, 142, 146, 152; van der Plicht *et al.* 2004, 476–479). The tunic from Reepsholt, Niedersachsen, was dated by palynology to 600 BC–AD 200 (Potratz 1942, 11). Some of its technological features, however, seem to indicate a rather late date, in the Common Era, which was already assumed by Hanns Potratz (1942, 26).
- 3 The names are always given in German here, since only some of the federal states have commonly used English names: Bayern = Bavaria, Hessen = Hesse, Niedersachsen = Lower Saxony, Nordrhein-Westfalen = North Rhine-Westphalia, Rheinland-Pfalz = Rhineland-Palatinate, Sachsen = Saxony, Sachsen-Anhalt = Saxony-Anhalt, Thüringen = Thuringia.
- 4 Reinecke did not publish his suggestions systematically but presented parts of them in different publications; see *e.g.* Eggers 1986, 106.
- 5 Vogt had not analysed this find personally (1937, 43).

- 6 The pieces are carbonised, which might be an argument in favour of their plant origin. Manfred Haupter, for example, claimed that wool cannot be carbonised (1989, 697). However, von Stokar (1938, 16) suggested that wool could become carbonised more easily than plant fibres. Hundt reported on a carbonised wool textile from Switzerland, dated to the Hallstatt Period (1969–70, 256). A carbonised Roman Iron Age fabric from Feddersen Wierde, Niedersachsen, turned out to be a combination of flax and wool (Tidow and Rast-Eicher 2001, 56). Another example is a carbonised Middle Bronze Age band found on Crete. It was determined by the present author as consisting of plant as well as animal fibres, which was confirmed and identified as flax and nettle, as well as goat-hair (*cf.* Spantidaki and Moulherat in this volume).
- 7 While von Stokar (1938, 103) mentioned cattle- and goat-hair as an admixture to sheep wool, Bender Jørgensen (1992, 51 and 224) described the material as wool; see discussion below.
- 8 Hundt had mentioned this piece already much earlier (1958b, 26) but without providing any technical details.
- 9 Hundt had referred to this item at least three times, once describing it as made of flax and wool (1969–70, 257–258), but mentioning flax twice only (1971, 115; 1974, 49). The weaving structure “tabby” is only stated in the text from 1988. Banck-Burgess (1999, 205) listed the site as Steinheim an der Murr, Baden-Württemberg, giving the date as “probably Hallstatt”.
- 10 The material was determined as plant fibre material by Klaus Tidow, Neumünster (Ehlers 1998b, 153), while earlier, the fragment had been considered as wool (Just 1964, 310).
- 11 However, Scherping’s arguments – thread diameter of 100–160 μm , fibre diameter of 10–15 μm , lack of visible twist and scales – are not unambiguous.
- 12 There are several finds from Damendorf. In his book from 1976, Schlabow mixed up certain details of at least two bog bodies from the site. In Schlabow’s text from 1938, however, it is clear that this is a fragment excavated in 1934 together with the body of a 13- to 14-year old girl. The find in general is described by Schlabow (1976, 17) as no. 7 and the fragment is mentioned as the remnant of a blanket while in 1938, he considered it as a possible cloak.
- 13 Later, a ^{14}C date was obtained, pointing to the 9th century BC, *i.e.* Late Bronze Age (van der Sanden 1995, 146; van der Plicht *et al.* 2004, 479). However, it was not the textiles themselves that were tested but some hairs, which were said to belong to the related bog body, a girl of 13–14 years. The hair was provided by Alfred Dieck. Solveig Ehlers seemed to distrust the date and it is well known that Dieck’s work should be looked at with much caution (most recently: van der Sanden and Eisenbeiss 2006). Apart from this, also for methodological reasons, it is not known whether the ^{14}C date is reliable (van der Plicht *et al.* 2004, 488).
- 14 *E.g.* Schlabow 1937, 32; Hoffmann 1974, 170 (see also 156–164 for important remarks on Schlabow and Rosenfeld, 156–164); Ullemeyer and Tidow 1981, 97; however, Emil Vogt, in his 1937 publication on Neolithic textiles, did not agree with this conclusion (p. 113).
- 15 The aforementioned weights excavated by Hugo Jentsch (1889), which were also referred to by Barber (1991, 101), come from Niemitzsch or Niemitz, which is located in Poland today.
- 16 Following Marta Hoffmann’s arguments (1974, 164), however, and assuming that the outer edge of the border is depicted correctly by Schlabow with only one thread per shed, the edge on the fragment from Schwarza might be interpreted as a selvedge.
- 17 Two sites of the Early and one of the Late Bronze Age in Niedersachsen represented on Ehlers’ map are situated south of the area connected to Scandinavia.
- 18 According to Ehlers (1998b, 435, 447), there are two rep-like Bronze Age examples in Schleswig-Holstein, one from Harrislee (Period II) and one from Uelsby (Period III). Another was found beside a plankway in the Kiebitz Moor, Niedersachsen, and is dated by dendrochronology to *c.* 50 BC (Hayen and Tidow 1982, 29–31). A starting border, which according to Karl Schlabow (1976, 83–84) is neither tablet woven nor a rep band, was preserved in connection with the bog body excavated in 1884 near Damendorf, Schleswig-Holstein. The radiocarbon date of 410–390 cal BC is described as very precise (van der Plicht *et al.* 2004, 485).
- 19 Bender Jørgensen (1992, 52) mentioned S2z twist for both systems of this find. The information about the twist direction given by Hundt is sometimes ambiguous, but clear in the publication from 1969–70. See footnote 9 above.
- 20 Hundt considered this item as belonging to northern Germany (1974, 50).
- 21 Bender Jørgensen (2005, 148) considered this piece as S2z/s.
- 22 In 1969–70 (p. 258), Hundt described this item as made of S-plied threads in the warp but single z-twisted yarns in the weft. Bender Jørgensen’s investigation, however, confirmed the use of plied yarn in both systems. Furthermore, Hundt (1963, 180) mentioned a 2/1 twill from Bastheim. However, due to poor preservation,

- Hundt was unable to provide any further information or a photograph, and he could not conserve the piece. If Hundt's identification as 2/1 twill is correct, this item is unique in its regional and chronological context.
- 23 The discussion about silk is focused on this find (see above).
 - 24 The Bescheid and Briedel finds, both in Rheinland-Pfalz, are described by Bender Jørgensen (1992, 227 and 2005, 148, respectively). Banck-Burgess (1999, 199) provided the same information for the former site, as did Hundt (1993, 137–138), while she reports the latter as z/z; von Kurzynski (1996, 105–106) did not mention the twist direction.
 - 25 The textile from Wallscheid as well as those of the below-mentioned sites Schwenderöd, Triftlfing, Konz-Filzen and Heidenau were analysed by Hans-Jürgen Hundt.
 - 26 Bender Jørgensen (2005, 147) wrote “S2z?” for one system.
 - 27 Furthermore, Bender Jørgensen (2005, 147) reported on such a sample from the aforementioned site of Wallscheid. Hundt (in Haffner 1976, 216–217) described the tabby from Wallscheid once as having Z-plied yarn in both directions and shortly afterwards as being made from Z-plied threads in one system combined with S-plied material in the other. Banck-Burgess (1999, 209) mentioned the latter for this piece.
 - 28 Banck-Burgess (1999, 198) described the threads as Z2s-plied.

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Case Study: the Textiles from the Princely Burial at Eberdingen-Hochdorf, Germany

Johanna Banck-Burgess

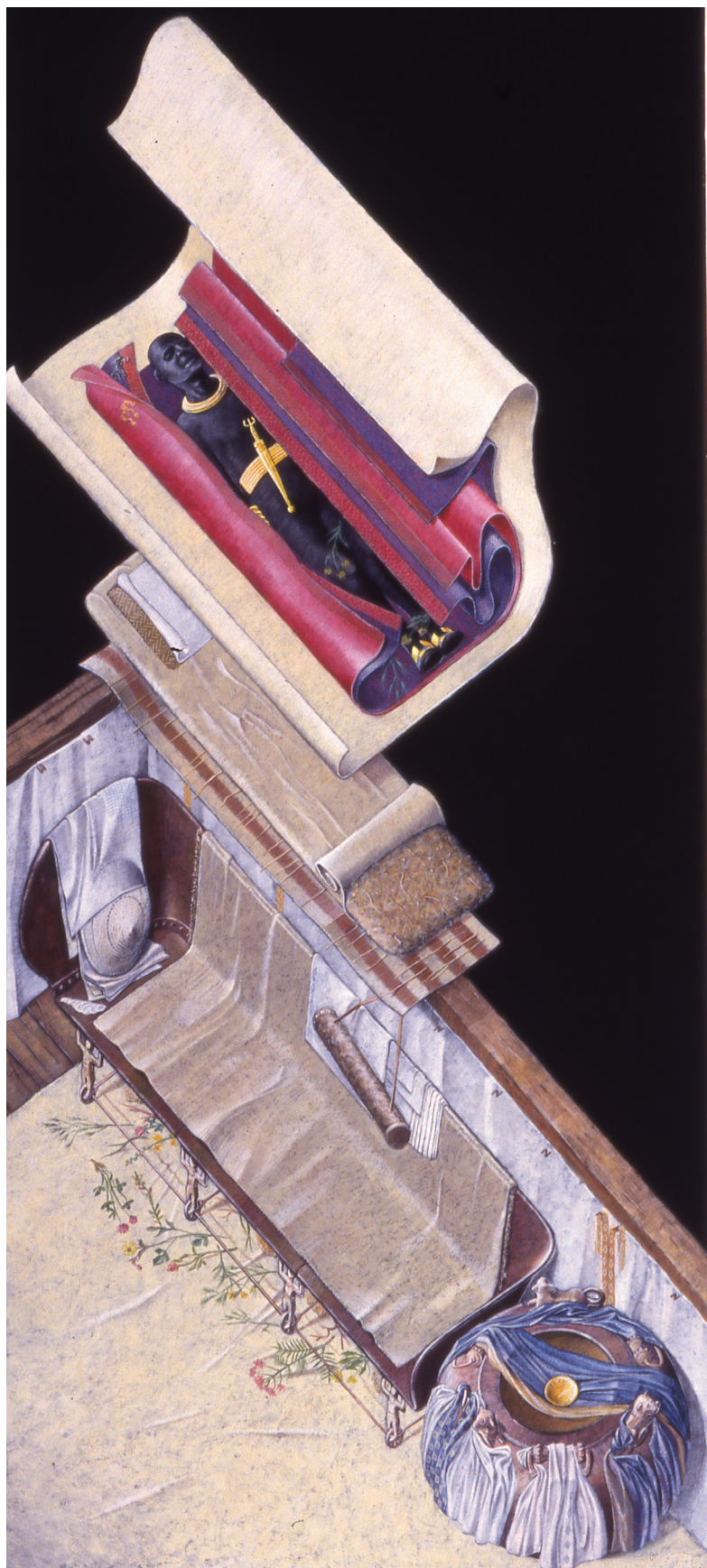
Introduction

During the last quarter of the 7th century BC, which saw the onset of the Late Hallstatt period (HaD), certain centres of power began to arise in southern Germany and neighbouring regions (Kaenel 2005). The mining of iron was essential for the formation of these power centres. They are largely documented by the so-called princely burials, which are marked by status symbols and imports from south of the Alps.

The investigation of the Early Iron Age burial mounds in southern Germany began already in the 19th century. In 1876–1877, Eduard Paulus recovered rich burial finds in the Gießübel near Hundersingen in north-western Baden Württemberg. Paulus realised that there was a connection between the burials and the nearby Heuneburg settlement (Kurtz 2003) and, using other Hallstatt period burial finds, he proposed the concept of ‘princely residences’ and ‘princely burials’ (Paulus 1877). The subsequent discovery of other spectacularly rich Late Hallstatt burials, such as Grafenbühl, excavated by Hartwig Zürn in 1964, highlighted the prominence of the early Celtic princely burials. Almost a century after Paulus, Wolfgang Kimmig (1969) formulated the criteria for the Late Hallstatt period aristocratic residences.

These criteria, which are still valid, include the presence of specific types of materials, fortifications, imports from the Mediterranean and richly furnished burials in close vicinity to the site.

The princely burial at Eberdingen-Hochdorf, Baden Württemberg first came to light when ploughed-up stones from the burial emerged in 1977. It was excavated in a two-year period from 1978 to 1979. This early Celtic princely burial constitutes part of an Early Iron Age cultural context, specifically the western group of the Late Hallstatt culture. The content and the richness of the furnishings of the burial chamber where the deceased was laid to rest around 530/520 BC, allow us to reach wide-reaching conclusions about the life of the early Celts (Biel 1985). The elevated status and lifestyle of the deceased, is reflected in the funerary gifts, such as the bronze and ceramic drinking and dining sets, a Greek bronze cauldron decorated with lions, a bronze couch, weapons, gold jewellery, a wagon and precious textiles. Personal grave goods, such as a quiver, a birch-bark hat, as well as scattered flowers also accompanied the deceased into the afterlife. Many of the goods such as the bronze couch or the cauldron



were excavated in blocks and were brought to the archaeological restoration workshop at the Landesmuseum in Stuttgart, where they were conserved, restored and meticulously documented in years of labour. The seven monographs published to date demonstrate the wealth of information contained in the burial, and they only touch the surface of what is still to be learned from this unique tomb (Küster and Körber-Grohne 1985; Keefer 1988; Krauß 1996; Banck-Burgess 1999; Bieg 2002; Koch 2006; Schatz and Stika 2009).

To date, the research has primarily concerned the inorganic finds, such as metal, ceramics or stone elements of the burial construction. However, the degree of preservation in the burial of Eberdingen-Hochdorf was highly unusual. At the beginning of the late Hallstatt period, a number of conditions contributed substantially to the survival of many archaeological textiles. While the earlier Hallstatt period is characterised by cremation burials, inhumations are predominant in the later Hallstatt period. The rich furnishings of the princely burials provide particularly favourable conditions for the formation of mineralised textiles. Furthermore, the burial chamber, which must have collapsed shortly after the interment of the deceased and thus buried the contents under almost airtight conditions, was neither looted in antiquity nor disturbed by modern deep ploughing.

The Grave and its Textile Furnishings

The description of the find of textiles during the excavation of the tomb has entered the realm of saga. Jörg Biel, the excavator, saw colourful drapings of cloth on the cauldron and in other areas of the burial chamber, which literally turned into dust in front of his eyes. This first impression of the textile furnishing of the tomb must have been breathtaking.

The largest part of the surviving textile finds, which were located close to the large bronze cauldron and the bronze couch, were meticulously recovered and documented by conservators at the Landesmuseum in Stuttgart.

Detailed analyses have made it possible to reconstruct the position of the textiles in the burial (Fig. 5.1; Banck-Burgess 1999). The original splendour of the textiles with



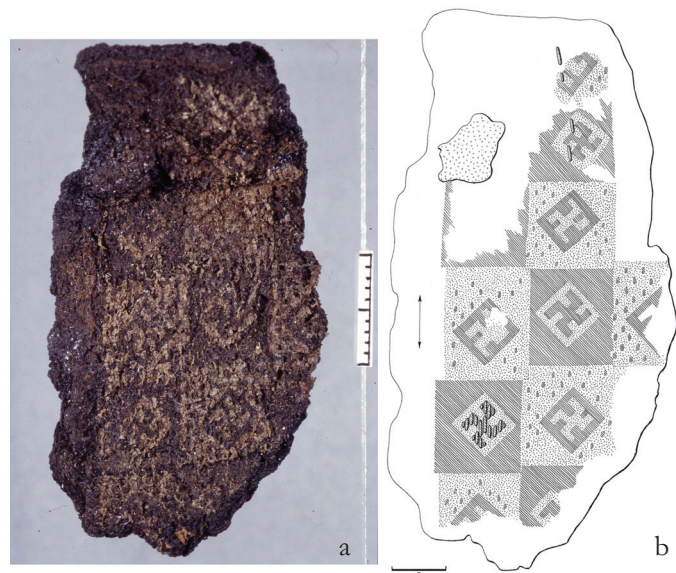
Fig. 5.1. (opposite page) Eberdingen-Hochdorf, the reconstruction of the burial chamber and its textile furnishings in an enlarged version (Drawing: J. Banck-Burgess).

Fig. 5.2. Fabrics draped over the cauldron, detail of Figure 1 (Drawing: J. Banck Burgess).

their distinctive blue and red colours was reconstructed on the basis of dyestuff analyses by Penelope Walton-Rogers (1999). The textiles included various coverings and hangings used as furnishings of the burial chamber. The deceased rested on the bronze couch with a lavishly worked mattress and was shrouded in precious textiles, among them a luxury cloth of red colour. The rich textile furnishings also included fabrics that were draped over the cauldron and the wagon. The cauldron alone was covered with at least three exquisite textiles of different structures (Fig. 5.2).

The majority of the finds were tiny, mostly fingernail-sized fragments or comparable compact packets of organic substance in a thickness of a few millimetres (Figs 5.3–5.6). Larger surviving fragments derive from the bronze couch and the cauldron (Figs 5.3–5.4). Hans-Jürgen Hundt began the work on the textiles (Hundt 1985), but due to his advanced age, he passed on the task of further examination and analyses to the present author, who spent four years working with this fascinating material.

The predominant weave of all the textiles is a 2/2 twill, and there are only a few examples of tabby and diamond twill. The various colour and spin patterns, integrated tablet-woven bands, additional soumak pattern elements or unusual raw materials represent a plethora of different textiles. The fibre analyses



demonstrated that the majority of textiles were made of wool, but more unusual materials such as the underwool from a badger's fur have also been identified. Due to the poor preservation conditions of plant fibres, only fabrics of hemp have survived while linen could only be identified in minute remains.

Finds from the princely burial at Eberdingen-Hochdorf were also included in the group of the earliest silk finds based on the comparison with the textile finds from the double grave (Grave VI) of the burial mound of Hohmichele (Altheim-Heiligkreuztal) in Baden

Fig. 5.3. Tablet weave from the cauldron (Object 1.44): a) the original; b) drawing. The tablet weave has pattern areas of stacked quadrants with solar symbols. They were woven with blue threads of plant origin (presumably hemp bast) and wool. Photo scale 10 mm; drawing scale 5 mm (Drawing and photo: J. Banck-Burgess).

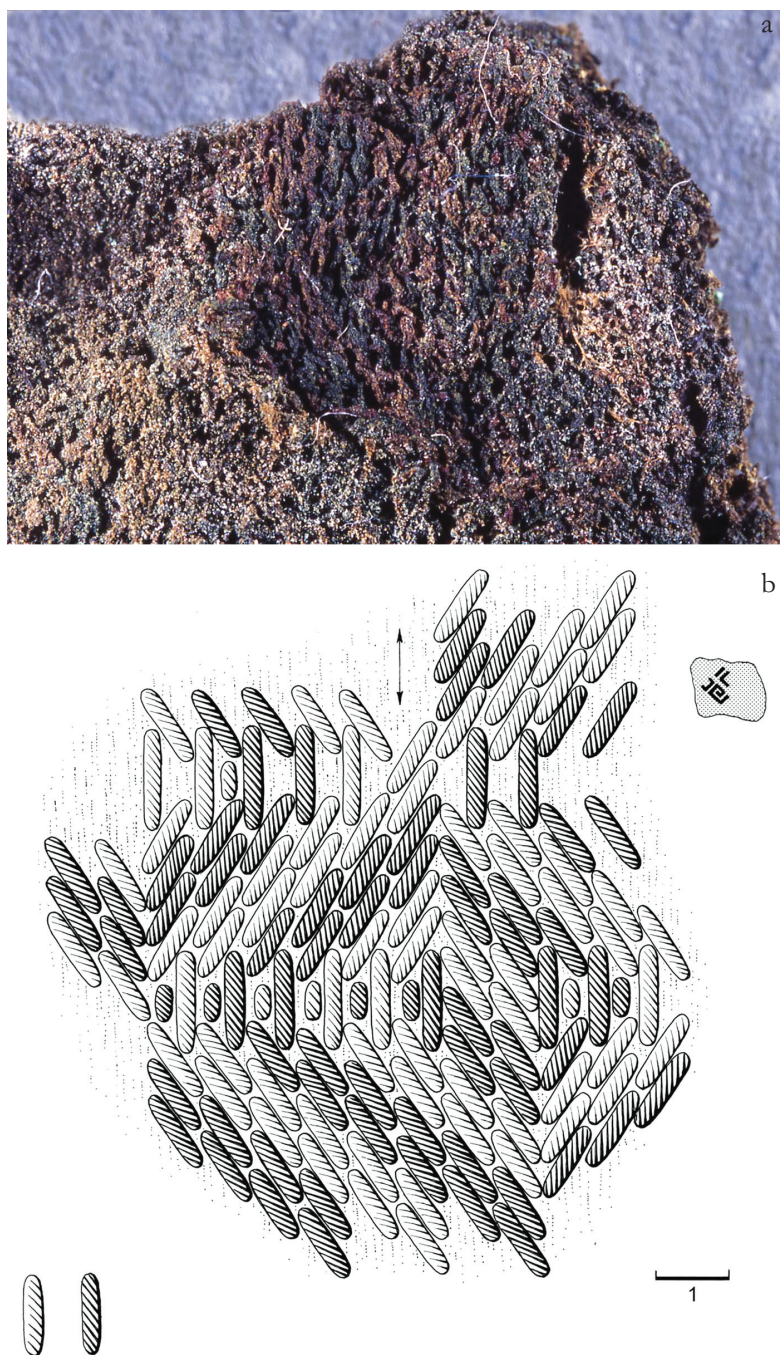


Fig. 5.4. Patterned tablet weave from the cauldron: a) original and b) drawing. The tiny fragment shows part of a two-colour meander pattern. Traces of red and blue are still visible. Scale 1 mm (Drawing: J. Banck-Burgess).

Württemberg. Hans-Jürgen Hundt published a piece of embroidery from Hohmichele that may have contained silk thread. This identification was supported by somewhat ambiguous scientific analysis (Hundt 1962, 208) and for a long time this piece was regarded as the oldest silk find north of the Alps. However, more recent amino acid analysis has definitively demonstrated that the finds from Hohmichele and Hochdorf are not

made of silk (Banck-Burgess 1999, 234–240; but cf. Möller-Wiering this volume). Technically, the finds are not embroideries but rather weft wraps (soumak) that were introduced during the weaving process (Banck-Burgess 1999, 55–62).

The Realm of the Dead: Burial Textiles and Burial Customs

Textiles were an important part of the burial ritual and allow us a glimpse into early Celtic ideas about the afterlife. The deceased with his rich textile furnishings was wrapped in a coarse piece of fabric. Additionally, parts of the wagon show clear traces of several layers of wrappings. All the precious burial goods were also covered and thus rendered invisible at the entrance into the otherworld (Fig. 5.7).

There is also ample proof that the textiles and the mattress elements were produced especially for this burial. In spite of the richness of different fabrics and patterns, the production techniques and appearance of the textiles demonstrate a striking similarity. The different parts of the badger fur, the fine under-wool and the coarser guard hair, as well as the skin (leather) were used for various items placed in the grave. The coarse badger hairs, in addition to plant material, were used as the stuffing for the mattress and the pillow; the fine underwool was used for tablet weaves and the fine plain weave fabric, while the leather was utilised as part of the mattress cover. The latter, as well as other covers of the bronze couch were made from hemp. Threads of fine hemp bast, together with fine threads of badger underwool, were worked into tablet-woven bands. The preferred use of S-plied warp and z-twisted weft indicates that the fabrics were products of the western Hallstatt area (cf. Möller-Wiering, Grömer in this volume). The tablet weaves, which were originally interpreted as imports due to the Mediterranean decorative motifs (Hundt 1985), have proven to be of local production. The wefts in the tablet weaves are not visible, as a rule. Furthermore, it is likely that the tablet-woven bands constituted the edges of a larger, locally produced twill textile.

The Hochdorf material demonstrates how important observations *in situ* are for the interpretation of textiles. In the Hochdorf grave, there are several indications that the funeral proceedings, during which the burial

chamber was furnished and the deceased laid out, occurred in a hurry. This is particularly noticeable in the case of the wall hangings that seem to have been attached unevenly as if in great haste. Some of the hooks were hammered into the wall together with the textile hangings (Fig. 5.8). When the chamber collapsed, the hangings were torn off the hooks. Remnants of string further indicate that it was used in this makeshift attachment. Traces of the seams connecting the finely woven twill fabrics and the tablet-woven bands show that the sewing was very coarse. In some places, the bands were not sewn evenly to the wall hanging, but were rather wrapped around the wall hook. The floor covering shows signs of wear, the threads of the twill fabric were strongly distorted, which could easily have occurred when the heavy furnishings were dragged over it. The shrouding of the body may be related to myths of the afterlife. Not only was the body covered for practical reasons, it may have been also necessary to conceal the conspicuous wealth

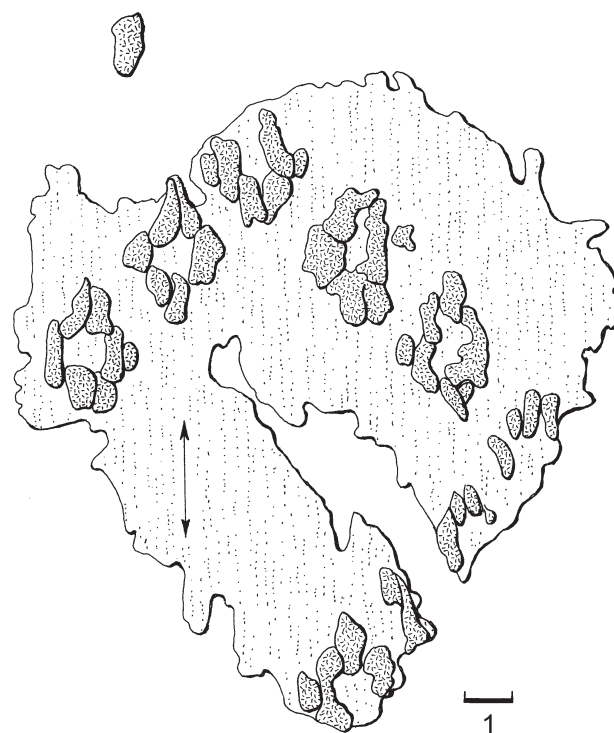


Fig. 5.5. (above) A patterned tablet weave from the chariot (Object 2). The pattern consists of small rosettes, arranged in a diamond shape. The threads are of plant fibre (presumably hemp bast) and animal fibres. The tablet weave had at least three colours; indigotin was detected. Scale 1 mm (Drawing: J. Banck-Burgess).

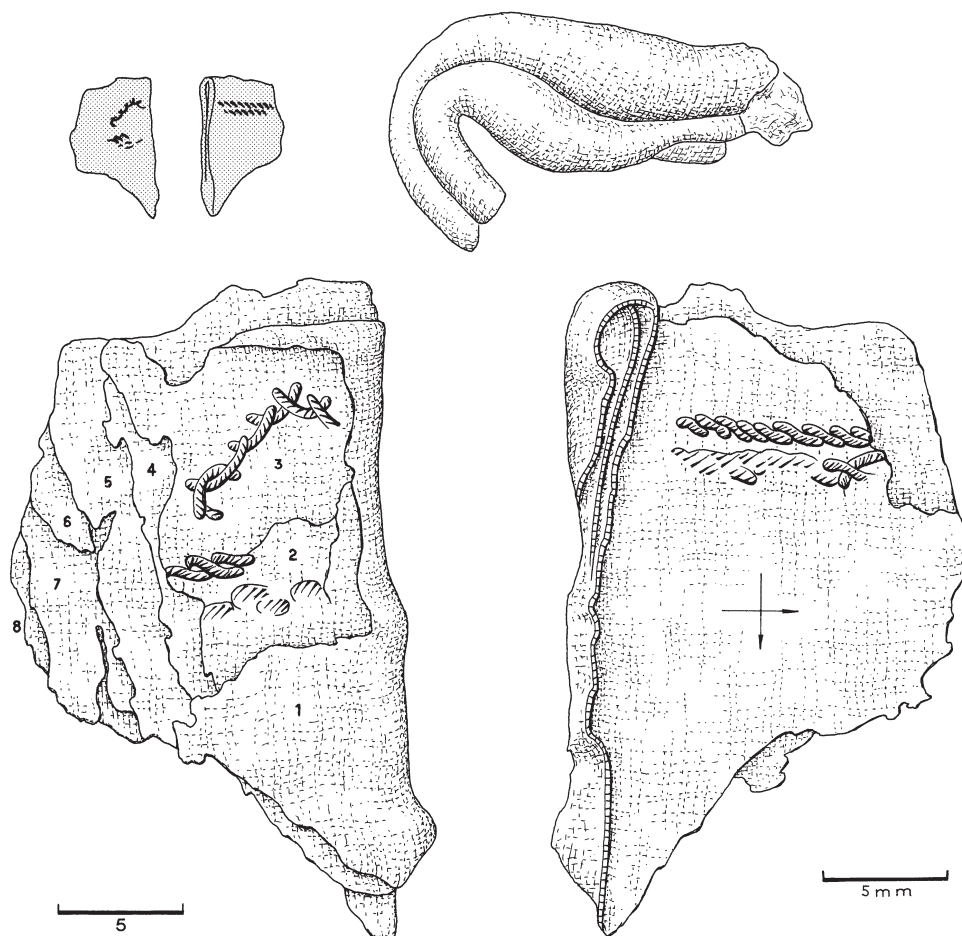


Fig. 5.6. Textile packet from the quiver, which originally hung from the back rest or the couch. Part of a carefully folded fabric (Fundnr. 943A), whose uppermost and lowest layer (a total of 8 layers) show weft wraps. Scale: 5 mm. (Drawing: J. Banck-Burgess).

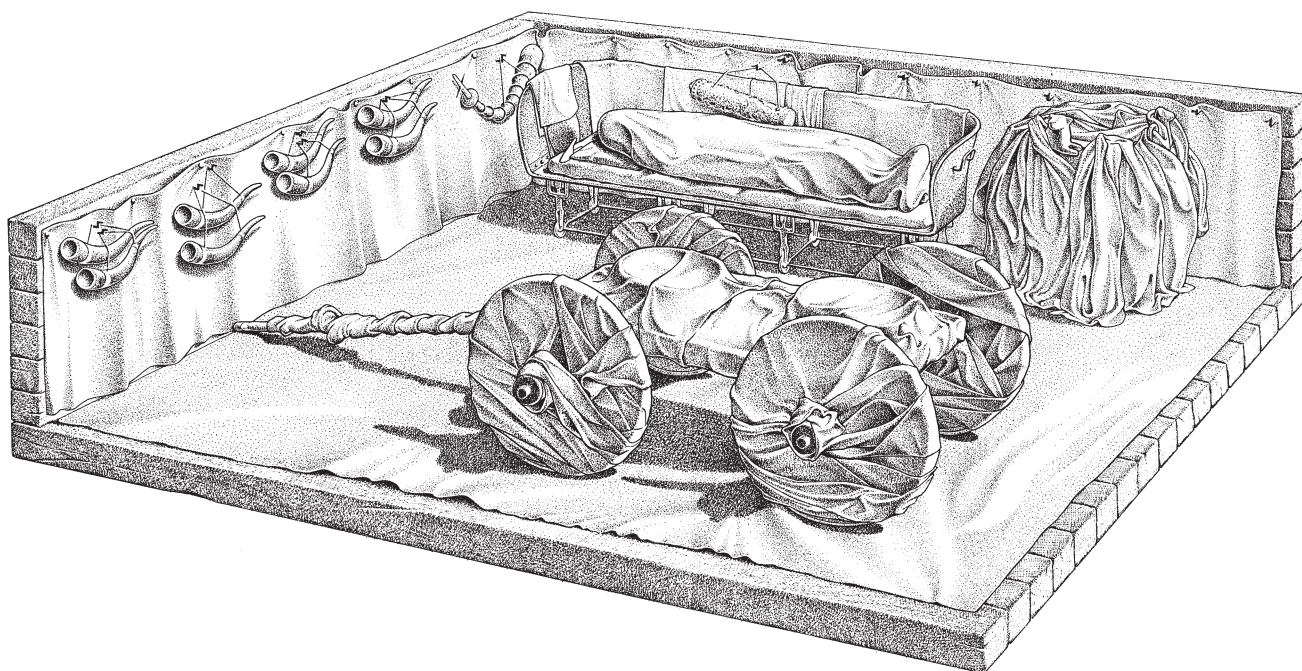


Fig 5.7. Reconstruction of the burial. For their entry into the afterlife, the deceased and the splendid grave goods were wrapped in textiles. (Drawing: J. Banck-Burgess).

and the functional aspect of certain objects, such as weapons and knives, during the entry into the afterlife. A custom common during the Early Iron Age throughout Europe seemed to dictate that certain items were wrapped in fabric or stored in baskets or other containers (*cf.* Gleba in this volume). In the Early Iron Age, princely burials in southern Germany and eastern France contained multilayered wrappings especially in connection with parts of wagons, metal dishes or knives. In the princely burial at Hochdorf, the deceased with his gold jewellery and precious cloths was wrapped in an undyed wool fabric (see Fig. 5.7; Banck-Burgess 1999, 18–32).

Burial Textiles as a Reflection of the Living

The question of whether the burial textiles were also used in life is difficult to answer. There is no doubt that the furnishing textiles of the tomb, the covers of the mattress elements as well as the covers of the floor and walls, would also have been present in the residences of the early Celtic elite.

All four walls of the Hochdorf tomb were covered with wall hangings consisting of two alternating fine 2/2 twills, one of them spin-patterned. The textiles were decorated with narrow tablet-woven bands 3 cm wide.

The bands had braided and lozenge-shaped meander (*Zinnmänderrauten*) patterns (Fig. 5.8) and were attached to the walls of the burial chamber with iron hooks, 41 of which were found near the base of the walls.

Undoubtedly, the upholstered item on the bronze couch was a mattress. The stuffing contained a combination of seeds, needles of coniferous trees, blades of grass, thin twigs and other small plant particles, moss and tufts of animal hair (Körber-Grohne 1985). The large number of fragrant plants used demonstrates that the selection of the stuffing material was well planned. The mattress was held together by a hemp bast cloth, whose tightly woven structure was similar to the modern mattress covers. In the area of the deceased's head was a pillow, which was covered with braided blades of grass. Areas at the edge suggest that it was diagonally plaited. The pillow was a plain weave textile made of badger underwool. Both tabby thread systems consist of S2z-twisted yarn. The know-how to make such a high-quality mattress or pillows was most certainly also utilised for the living (Banck-Burgess 1999, 97–103, 120–124).

The visible traces of colour on the fabrics, which disappeared almost immediately during the excavation, do not reflect their original splendour. However, dye analyses were performed on all woven material, 49 samples

Fig. 5.8. (opposite page) Patterned tablet weave from wall hook 203: a) original; b) drawing. The pattern consists of two running dog motifs, one above the other (Drawing: J. Banck-Burgess).

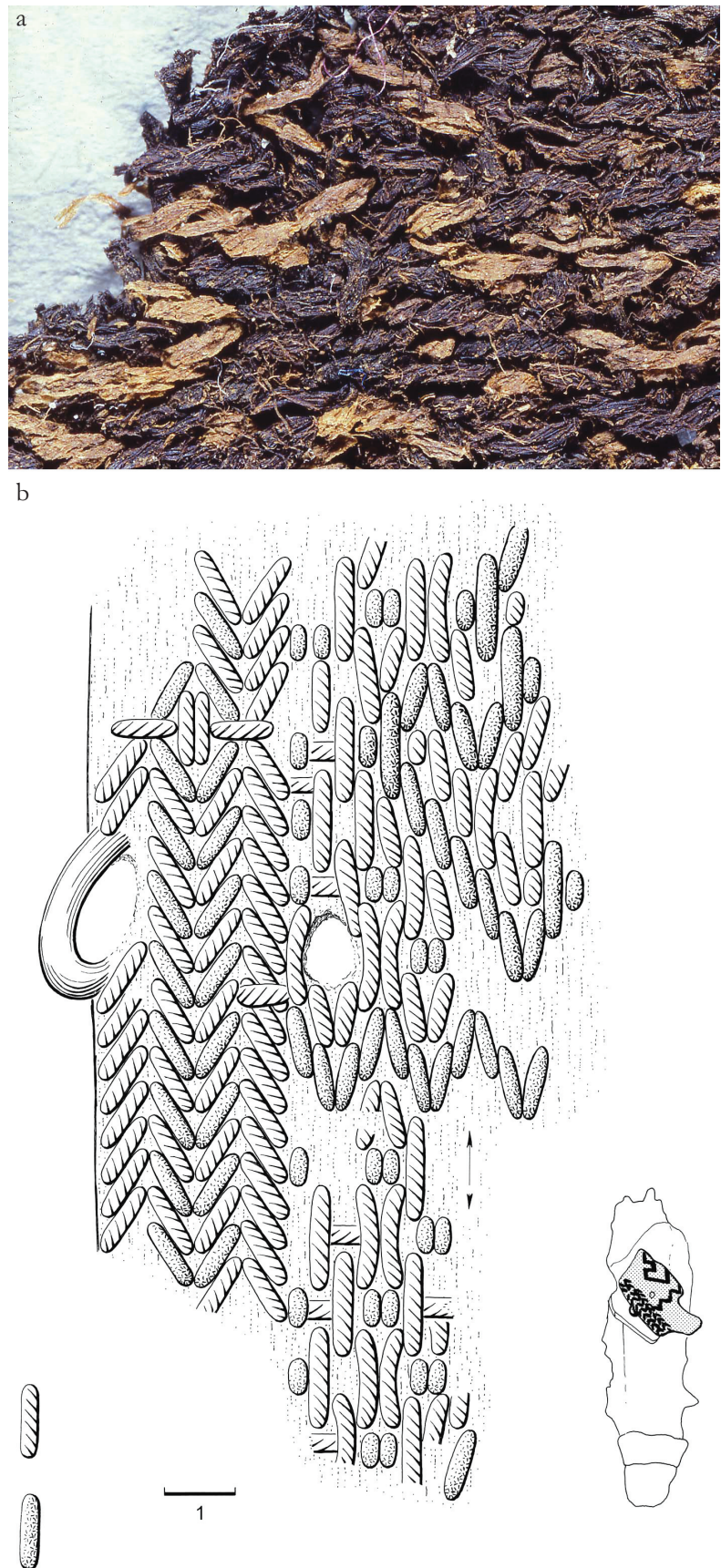
in total (Walton-Rogers 1999, 240–245). The analysis further demonstrated that the preservation state of the fibre, *i.e.* the degree of degradation, was not decisive for the survival of dyestuffs. For instance, in some relatively well-preserved fragments, with visible red and blue traces of colour, dyestuffs could not be detected, whereas some black fragments with highly decomposed threads had definite traces of indigotin or kermesic acid. The results of the dye analyses also confirmed that the textiles in the burial chamber were predominantly red and blue. The dyes were used for single-colour fabrics, in dogtooth patterns or in rich patterns in the tablet-woven bands.

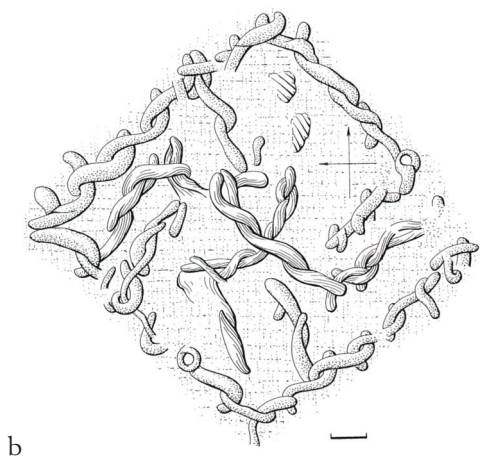
In all likelihood, the source of indigotin was woad (Walton-Rogers 1999, 243). The source of the red dyestuffs shed new light on the close ties of the early Celts with the civilizations south of the Alps. The high percentage of kermesic acid and the complete absence of carminic acid indicate that the dye source was the insect *Kermes vermilio*, which is to be found predominantly in the Mediterranean littoral. Its northernmost growing area is southern France. Since the examination of the textiles indicated domestic production, we can conclude that it was the dyestuff that was imported from southern Europe. Dye experiments with *Kermes vermilio* have demonstrated that the palette of possible hues is extensive, varying from maroon-red to purple. As with all dyestuffs that require a mordant, the preparation and the tools used will have a decisive effect on the resulting hue. In the finely woven, dogtooth patterned fabrics, the red and blue colour areas can be seen, but they merge into a purplish colour at some distance.

Textiles: Medium of Communication and Identification

The visual appearance of the textiles most obvious to the human eye – their patterns, colouring, texture and draping – was a medium of communication. The methods of production, including the techniques employed and the structural characteristics of the textiles represent another aspect of the fabric that is not necessarily visible or can only be detected on closer examination.

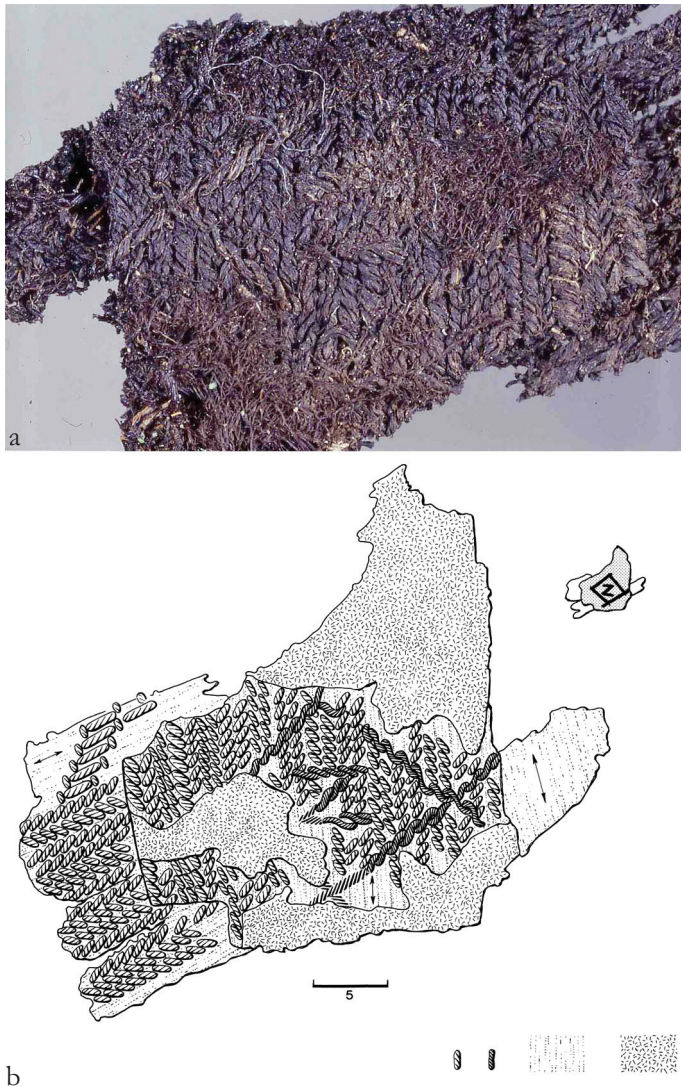
The wealth of patterns and production techniques among the textiles of Hochdorf provided a starting point for the examination





of how these patterns were created (Banck-Burgess 1999, 53–65). Among the early Celts, structural patterns, colour and spin-patterns are dominant. The way the two thread systems interact produces structural patterns. For the colour patterning, it is the sequence and combination of the coloured warp and weft threads that produced the pattern; but the structure of spin-patterns influences this decorative effect as well. The spin-pattern depends on light, because threads twisted in different directions reflect the light in different ways. These basic pattern techniques were used to create stripes, diagonals, zigzags, diamonds and checks.

From Hochdorf and Hohmichele, we have several examples of supplementary pattern threads. It is a combination of weaving and a soumak technology that is used, where additional weft threads are wrapped around individual warp threads during the production of the textile. In this case, the additional weft thread follows the pattern exclusively and is not integrated in the ground weave. This production method is embedded in a tradition



that can be followed as far back as the Neolithic period, and continued also in later times (Banck-Burgess 1998, 473–477; 1999, 55–63; cf. Grömer in this volume). A thousand years later, it was used in Coptic textiles, where it became known as a kind of soumak wrapping (*fliegender Faden*). This technique should not be confused with embroidery. During the analysis under magnification, it is often possible to distinguish between an embroidery thread, piercing through the threads of the weave, and a wrapped weft thread running between two warp threads.

While at Hohmichele only one piece of rep weave in soumak technique was recovered (Fig. 5.9), the Hochdorf find contains several fabrics produced with this technique (Fig. 5.10). They underline the high degree of skill involved in the production of these textiles. Draped

around the large bronze cauldron was a fine 2/2 twill fabric with stripes worked in different twist-directions, with fine diamonds containing swastikas running in the warp direction. The diamonds and parts of the inner decoration were worked with a red wool thread, while the solar symbols inside were worked with a blue thread, presumably made from hemp. Near the quiver, which hung over the back of the bronze couch, there was a similar fabric, with a blue pattern thread, but only parts of a diamond could be recognised. The same pattern was also used in several of the tablet-woven bands. On the bronze couch there was a delicate tablet weave, which consisted of alternating rows of S and Z-turned tablets. On the surface is the diamond-shaped part of a grid pattern with an inner “Z” made in soumak technique (Fig. 5.11). There were also numerous tablet-woven

Fig. 5.9. (opposite page) Hohmichele (Kreis Biberach) grave VI (Fundnr. 6). Detail of a patterned rep weave with the path of the pattern thread, as it is applied as a wrapped weft thread in the weave (Photo: J. Banck-Burgess).

Fig. 5.10. (opposite page below left) Pattern element a) original and b) drawing. Textile from the cauldron (TK 7B). A pattern element which was applied by means of weft wrapping in a very fine 2/2 twill during the process of weaving. It shows a diamond containing solar symbols. In addition, the twill fabric is also patterned by the spin-twist direction in one of the thread systems. Two vertically stacked pattern elements survived, woven with blue threads of plant origin (presumably hemp) and wool threads (dyestuff undetectable). Scale: 1 mm. (Drawing and photo: J. Banck-Burgess).

Fig. 5.11. Tablet weave: a) original and b) drawing. Tablet weave of wool in several layers: the uppermost layer shows part of an additional diamond-shaped part of a grid pattern (TC 8). Inside the diamond is a Z-shaped pattern. The decoration was worked with the help of weft-wrap during weaving. Scale 5 mm (Drawing and photo: J. Banck-Burgess).



Fig. 5.12. Drawing of a patterned tablet weave twill structure with rep characteristic (TC 154). The pattern area is surrounded by simple cords. The visible patterning shows solar symbols, one arranged above the other. The tablet weave was worked in threads of wool and plant fibre. Scale 1 mm (Drawing: J. Banck-Burgess).

fragments on the couch (Fig. 5.12).

The linen fabric of the southern Slovak Nové Zámky, found in an early La Tène grave, was probably worked in a similar technique. The so-called trumpet pattern was originally thought to be embroidery (Pieta 1992; Belanová-Štolcová in this volume), but in its technique it resembles the finds described above. This combination of weave and soumak has been identified in the Neolithic textiles from the lakeshore settlements in the piedmonts of the Alps (Vogt 1937). The Northern Italian pile dwelling of Molina di Ledro yielded a long band of linen with a pattern of concentric diamonds woven in a technique similar to twill (Perini 1970; Fascani 1984, 505–506; Bazzanella in this volume).

Conclusions

The importance of textiles can be traced through the existing production traditions and their continuation as well as in inspirations and/or elements from other cultures that were adopted or modified. In Hochdorf, two very fine twill fabrics belonged to the garments of the deceased. In addition to a red cloth with tablet-woven borders, the deceased was covered from head to toe in another cloth made of red and blue yarns. The weave structure in 2/2 twill resulted in a dogtooth pattern. Like the red cloth, this textile was decorated with richly patterned tablet-woven borders. The dogtooth fabric and the red cloth are characteristic of the western Hallstatt area in their use of S2z-plied and z-twisted single threads in either warp or weft only (Banck-Burgess 1999, 37–39). Another fabric, which was only found on the lower part of the body, is almost the same as the above-mentioned dogtooth patterned fabric. As to fibre, fineness of the weave, dye and weave structure, there are only minute differences. The main difference is in the type of thread used, *i.e.* the latter fabric has single z-twisted yarn in both warp and weft. The use of single threads in both warp and weft is characteristic for the Mediterranean area (Banck-Burgess 1999, 43–48).

It can be concluded that the deceased was wrapped in two fabrics which were similar in appearance, but which belong to two different production traditions, judging by their technical characteristics. This would indicate that the production technique and the appearance of

the textiles were seen and valued separately from one another. While the checks or dogtooth patterns are widely common to fabrics from Iron Age Europe, the production technique was marked by culture-specific elements.

The richness of textile furnishings found in the burial chamber of the early Celtic princely burial at Eberdingen-Hochdorf has to date been equalled only by few of the Early Iron Age burials in Europe. The deceased was wrapped in luxurious textiles. Elements of the mattress, wall hangings and floor coverings testify that a high degree of comfort was also to be retained in the afterlife.

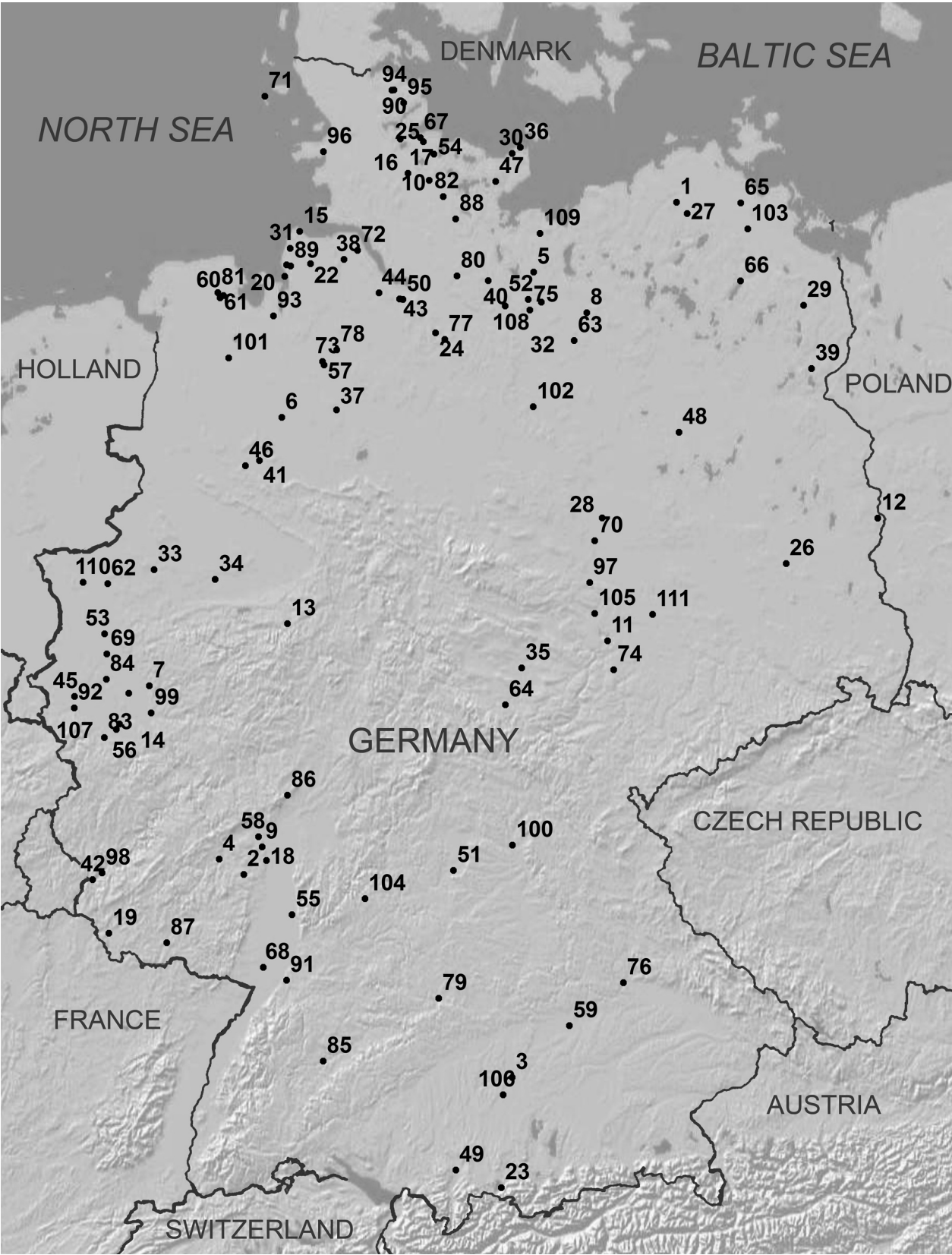
The way the textiles were produced and their appearance represent two different aspects of the early Celtic culture, subjected to different sets of rules. The production process seems to have been closely related to working traditions of the local area, while the visual appearance of the fabrics displays culturally determined preferences. There is no doubt that certain visual appearances were desired and imitated. While large-scale trade in textiles as consumer goods may probably have been unlikely, they constituted part of a prestige gift exchange. In the burial of Eberdingen-Hochdorf, the textiles underlined the social status of the deceased in many ways. Precious and ostentatious textiles prove that garments were used as an effective medium of expression. The red cloth and the red and blue cloth underneath were both decorated with tablet-woven borders, which were as eye-catching as the shimmering gold jewellery. The burial chamber furnished with textiles that covered the walls as well as the floor provides evidence, for the first time in a prehistoric context, for the utilitarian textiles that might have also been used in the domestic sphere. The precious wall coverings in various techniques certainly compare well to the luxury garments of the deceased. Additional textiles were deposited separately in the burial as grave goods. The variety of these fabrics leads to the conclusion that they can be viewed as a mirror image of a trading centre for textiles, with the prince as the central figure. It is also very likely that, in the early Celtic context, textiles had a much closer tie to both spiritual and profane occasions and functions, and played a representative role.

Original text translated from the German by Ute Bargmann.

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GERMANY



Map 6.1. Germany. Sites mentioned in Chapter 6:

1 Alt Stassow	38 Hemmoor	75 Pritzier
2 Alzey	39 Herzsprung	76 Prüfening
3 Augsburg	40 Hornbek	77 Putensen
4 Bad Kreuznach	41 Hunteburg	78 Quelkhorn
5 Badow	42 Igel	79 Rainau-Buch
6 Barnstorf	43 Immenbeck	80 Rausdorf
7 Bergisch-Gladbach	44 Issendorf	81 Reepsholt
8 Blievenstorf	45 Jülich	82 Rendswühren
9 Bodenheim	46 Kalkriese	83 Rheinbach-Flerzheim
10 Bordesholm	47 Kasseedorf	84 Rommerskirchen
11 Braunsbedra	48 Kemnitz	85 Rottenburg am Neckar
12 Breslack	49 Kempten	86 Saalburg
13 Brilon	50 Ketzendorf	87 Schwarzenacker an der Blies
14 Cologne (Köln)	51 Kleinlangheim	88 Segeberg
15 Cuxhaven	52 Körchow	89 Sievern
16 Damendorf	53 Krefeld-Gellep	90 Sörup
17 Dätgen	54 Kronshagen	91 Stettfeld
18 Dienheim	55 Ladenburg	92 Stolberg
19 Dillingen-Pachten	56 Lommersum-Bodenheim	93 Strückhausen
20 Fallward	57 Mahndorf	94 Südensee
21 Feddersen Wierde	58 Mainz	95 Thorsberg
22 Flögeln-Voßbarg	59 Manching	96 Tofting
23 Forggensee	60 Marx-Etzel	97 Trebitz
24 Garlstorf	61 Marx-Stapelstein	98 Trier
25 Gettorf	62 Mehrum	99 Troisdorf
26 Gießmannsdorf	63 Milow	100 Unterhaid
27 Gnoien	64 Mühlberg	101 Vehnemoor
28 Gommern	65 Neu Pansow	102 Vitzke
29 Göritz	66 Neubrandenburg	103 Völschow
30 Gremersdorf-Techelwitz	67 Neudorf-Bornstein	104 Walldürn
31 Gudendorf	68 Neupotz	105 Wansleben
32 Hagenow	69 Neuss	106 Wehringen
33 Haltern	70 Nienburg	107 Weilerswist-Klein-Vernich
34 Hamm-Westhafen	71 Norddorf	108 Wiebendorf
35 Haßleben	72 Obenaltendorf	109 Wotenitz
36 Heiligenhafen	73 Osterholz	110 Xanten
37 Helzendorf	74 Pretzsch	111 Zauschwitz

Germany: Roman Iron Age

Susan Möller-Wiering and Julian Subbert

Introduction

The overview provided in this chapter covers about 400 years, *i.e.* the first four centuries of the Common Era. In some respects, it represents an extension of the chapter on the German Bronze Age and Pre-Roman Iron Age in this volume, not only chronologically but particularly regarding the textile research since many protagonists are the same.¹ Furthermore, in terms of the textile material, some continuation from the Pre-Roman to Roman Iron Age is visible. Yet, the presence of the Romans had a great impact on material culture, not only within the area of the Roman Empire, but also on the entire territory of modern-day Germany, as Roman imports of luxury goods in the north and east prove. It is an open question, however, to what extent this may also be true for the manufacture and distribution of textiles. Therefore, one aspect of this chapter is to illuminate both these cultural spheres separately, before comparing them on a general level. The need for further in-depth research thus becomes clearly visible.

Due to the variety of archaeological sources and various conditions of preservation, the amount of noteworthy textiles of both Roman and Germanic origin is relatively large. Yet, their

distribution is not even. Within the Germanic regions, they are to be found in the north and in the east, while close to the Roman border the evidence is lacking. The textiles derive from graves, bogs, settlements and a few other contexts. Within the Roman Empire, the finds concentrate along its frontier. Urban sites play a great role, particularly Cologne and Mainz, but also Xanten, and they provide material from both refuse layers and rich burials in the context of their early churches. Moreover, some fabrics used as wrappings derive from hoards.

Chronological and Cultural Background²

During the Roman Iron Age, the area of the modern Federal Republic of Germany was mainly populated by Germanic peoples. Julius Caesar applied this term to all the tribes that lived east of the river Rhine. In AD 98, Tacitus reported on some dozens of tribes (*e.g.* Grane 2003). They inhabited the land of the Pre-Roman Jastorf culture (see Möller-Wiering, this volume), as well as the areas further south. In contrast to the parts occupied by the Romans, these regions are

known as *Germania libera*. The economy of the area was based on single farmsteads and villages, little division of labour and on local products, supplemented by some luxury goods and weapons acquired predominantly from the Roman Empire. Cremation continued as the most common burial rite, although towards the end of the Roman Iron Age, inhumations became increasingly popular.

In the former Celtic regions in the very south, a cultural break seems to have occurred at the end of the Pre-Roman Iron Age (Rieckhoff 2008), documented *e.g.* by the abandonment of large settlements (*oppida*) such as Manching in Bayern. In contrast, west of the Rhine, Celtic traditions of *oppida*, coinage and specialised crafts lived on. At the beginning of the period in focus here, these regions already belonged to the Roman Empire, split up into the provinces of – from north-west to south-east – *Germania inferior*, *Gallia belgica*, *Germania superior*, *Raetia* and *Noricum*. The Roman provincial culture was superimposed onto the Celtic structures or filled the gap where older traditions no longer prevailed. It was dominated by a Roman military presence along the frontier. People lived in urban or suburban settlements and in *villae rusticae*, which developed from Celtic manors. In many respects, the economy was based on the division of labour. Trade, including long-distance exchange, constituted an integral part of daily life, necessary not only for the procurement of luxury goods. During the Early Roman Period, the typical burial rite was cremation. From the 3rd century AD onwards, inhumations played an increasingly important role, using *e.g.* sarcophagi, lead coffins and gypsum.

Through the centuries, the Germanic-Roman border was not absolutely fixed. In fact, the Romans attempted to annex another province up to the river Elbe in the north, documented by written as well as archaeological sources. However, they were defeated several times, *e.g.* on the battlefield of Kalkriese in Niedersachsen, which is most probably the site where the Roman commander Varus lost the battle against the Germanic leader Arminius in AD 9. Thereafter, the Rhine constituted a rather stable border between the Germanic territory and the Roman Empire to the west, consolidating the separation of the two cultural spheres known from the

Pre-Roman period. Towards the south, the frontier was mutable throughout the entire period. During the 2nd century AD, the Limes was built, a fortified border stretching from the middle Rhine south-east to the Danube (*cf.* Gostenčnik in this volume). The Limes lost its importance about 100 years later, when raids of Germanic groups became more frequent, pushing the Roman army back south to a new frontier on the Danube. At the same time, certain characteristics of Germanic material culture like wooden buildings and hand-made pottery can be traced in the south-west while some aspects of the Roman economy lived on, particularly the use of coins (Stribny 1989).

Within the Roman sphere, traditionally the chronology is primarily based on pottery (especially *terra sigillata*), coins, building inscriptions and written sources, often resulting in absolute data (Fischer 2001, 34–40). Roman imports to *Germania libera* are also important for archaeological dating beyond the Limes. Following Hans-Jürgen Eggers (1986, 167, Abb. 15), the Roman Iron Age may be divided into an early phase (B1, B2; AD 1 to *c.* 150) and a late phase (C1–3; *c.* AD 150 to *c.* 375). In the present context, a few more decades of the Migration Period will be included, *i.e.* until the beginning of the 5th century AD. Horst Wolfgang Böhme (1974) divided the Migration Period into three stages, with stages I and II dating to the 4th century. Dendrochronological and ¹⁴C datings complete the picture.

Research history

As far as the Roman Iron Age is concerned, a valuable resource consists of the catalogues published by Lise Bender Jørgensen in 1986 and 1992. While the earlier volume contains information about Schleswig-Holstein in the very north, the later book deals with all other parts of the country. Older sources covering the entire area are the publications by Georg Buschan (1889) and Walter von Stokar (1938).³ Other texts are restricted to smaller regions or, most often, to single sites.

Concerning *Germania libera*, the bog finds attracted much attention from the 19th century onwards. The textiles of the Pre-Roman and Roman Iron Ages were examined *e.g.* by Johanna Mestorf (1900; 1907), Richard Stettiner (1911), Hans Hahne (1919) and others, before Karl Schlabow published his

seminal work on Iron Age textiles in northern Germany in 1976. As recent research in Denmark, as well as in Germany, has shown (Mannering and Gleba forthcoming; Möller-Wiering 2007; 2011), a re-examination of old finds with modern knowledge and techniques can often contribute more information and lead to new interpretations. A very important step in modern research on bog finds was taken by Wijnand van der Sanden (1996) and later, together with him, by Johannes van der Plicht *et al.* (2004) when determining the age of bog bodies using ¹⁴C dating.

The context of settlements is dominated by the material from the dwelling mound of Feddersen Wierde, published by Rudolf Ullemeyer and Klaus Tidow in 1981. Except for the above-mentioned work by Lise Bender Jørgensen (1986, 1992), information about textiles from graves is very scattered. Bender Jørgensen included much hitherto unpublished or only briefly mentioned material. Moreover, she could rely on publications often written by specialists like Hundt or Schlabow, as far as Western Germany is concerned. In the east, in the former German Democratic Republic, textiles were often not published separately but integrated into the general archaeological literature. An exception is the catalogue for Mecklenburg by Friedrich Just (1964).

The first finds of textiles in the Roman provinces in the 19th century did not lead to intense research. In 1938, Walter von Stokar published, among many others, some Roman textiles. However, he focused more on Germanic costume and the material nature of textiles. It was only in 1970, with the publication of John Peter Wild's seminal account, *Textile Manufacture in the Northern Roman Provinces*, which still constitutes the basis of much research on the topic, that Roman textiles became the focus of special attention. The majority of the continental finds he surveyed were from Germany. A bibliography of his further work is available in Penelope Walton Rogers *et al.* 2001. His most recent publication is about the wool industry in the North-West Roman provinces (Wild 2009). Lise Bender Jørgensen's *North European Textiles until 1000 AD* (1992) provided an overview of the textile fragments from Roman sites in Germany and a structural analysis of the data. Another 47 textiles from Mainz were published by John Peter Wild (1982). Anneliese Streiter

(1988) analysed fabrics from the collection of the Germanisches Nationalmuseum Nürnberg, most of which are from Mainz⁴ and a minor group from Cologne. About one fifth of all textiles are dated to the Early Roman period, up to AD 130. Nearly the same quantity could be dated to Late Antiquity, but they are mostly from graves. Many others can merely be placed generally in the Roman period or cannot be dated more precisely than "before AD 300". This is an important obstacle for the interpretation of Roman textiles from Germany. Thus, the picture drawn by Lise Bender Jørgensen has not changed significantly. Recently, a research project on the high status sarcophagus burials from Trier has been undertaken and elucidates some very precious textiles with gold weaves and fine imported materials (Dreyspring 2002; Reifarth 2006).

This chapter is primarily concerned with archaeological textiles. Textile functions are mentioned whenever possible. Research on clothing based on iconographic evidence is published by Wild (1968; 1985a) and Böhme-Schönberger (1985; 1997; 2000; 2009). The analysis of Noric-Pannonian clothing undertaken by Jochen Georg Garbsch (1965; 1985) is important for the southern parts of Germany (Schleiermacher 1972, 127).

The question of possible Roman textiles amongst the finds in *Germania libera* was raised by John Peter Wild (1968) and Lise Bender Jørgensen (1986), resulting in a joint discussion published in 1988. Later, the bog finds of Thorsberg (*e.g.* Hägg 2000; Möller-Wiering 2011) and Obenaltendorf (Möller-Wiering 2007) were interpreted in this perspective. The idea of Germanic products exported to the Roman Empire was touched upon by John Peter Wild and Lise Bender Jørgensen (1988).

Germania libera

Materials, Tools and Techniques

Textile production includes a number of steps from producing the raw materials to decorating a tailored piece. The only unquestionably verified fibres in *Germania libera* for larger fabrics are sheep wool and flax, supplemented by some gold for decoration and very little silk (Peek 1996, 124; Abegg-Wigg 2008, 287). The combination of flax and wool is known from Hemmoor in Niedersachsen (Geilmann



Fig. 6.1. Wooden flax breaker, Neu Pansow, Mecklenburg-Vorpommern (After Segschneider 2005, 146, Abb. 4).

and Gebauhr 1959, 262–263) and possibly Neudorf-Bornstein in Schleswig-Holstein (Farke 2004, 40–42).

Only some of the tools involved in the production process survive in archaeological contexts. In the area discussed here, the most common tools are spindle whorls and loom weights. They prove continuing traditions of spinning and weaving from Pre-Roman times onwards and the common use of the warp-weighted loom also in the very north of the country since the Early Roman Iron Age. Spindle whorls of clay or stone are known from graves and settlements, while loom weights are typical for the latter context. Loom weights are most often made of clay; items of lead – as the one excavated in Brilon in Nordrhein-Westfalen – are exceptional (Lukanow 1998, 13).⁵ This particular item weighing 610 g, dated to the Early Roman Iron Age, is of pyramidal shape. Pyramidal clay weights are very common, as are ring-shaped and conical ones. The typical contexts in which they appear are pit houses, where, occasionally, the weights are found in rows. Examples of settlements providing weights and/or whorls are Tofting in Schleswig-Holstein (Bantelmann 1955, 73), Feddersen Wierde in Niedersachsen (Ullemeyer and Tidow 1981, 116, 120–122), Alt Stassow in Mecklenburg-Vorpommern (Saalow 2005, 108), Herzsprung in Sachsen-Anhalt (Leube 1989, 535), Göritz in Brandenburg (Berg-Hobohm 2004, 52–60), Mühlberg in Thüringen (Laser 1989, 568) and Hamm-Westhafen in Nordrhein-Westfalen

(Cichy 2008, 17, 43). Spindle whorls from graves – cremations as well as inhumations – are known from *e.g.* Kasseedorf in Schleswig-Holstein (Articus 2004, 237), Gudendorf in Niedersachsen (Waller 1959, 27), Körchow in Mecklenburg-Vorpommern (Schuldt 1989, 525), Kemnitz in Brandenburg (Geisler 1984, 131) and Nienburg/Kr. Bernburg in Sachsen-Anhalt (Schmidt 1958, 467).

Bronze and, sometimes, iron sewing needles are reported in particularly rich female burials, *e.g.* in Kasseedorf in Schleswig-Holstein (Articus 2004, 237), Quelkhorn in Niedersachsen (Waller 1959, 21), Wotenitz and Badow in Mecklenburg-Vorpommern (Stange 1979, 85; Bemann 1999) and Braunsbedra in Sachsen-Anhalt (Hoffmann 1968, 352), as well as from Feddersen Wierde (Ullemeyer and Tidow 1981, 110) and the village of Völschow in eastern Mecklenburg-Vorpommern, which belonged to the Wielbark culture with its centre in Poland (Saalow and Segschneider 2005, 136; *cf.* Maik in this volume). Moreover, bone needles with eyes have been registered occasionally, *e.g.* in the dwelling mound of Tofting where bone spindles and bobbins are also reported (Bantelmann 1955, 73). An unusual find is a wooden flax breaker excavated at Neu Pansow in Mecklenburg-Vorpommern (Fig. 6.1; Segschneider 2005, 145–146). A possible iron weaving sword came to light in a female grave in Troisdorf near Cologne in Nordrhein-Westfalen (von Uslar 1938, 120).

Besides the tools themselves, the final products, *i.e.* the textiles, may provide some

insight into the techniques used at that time. For instance, the creation of sprang requires a frame, and certain bands and borders were sometimes woven using small, thin tablets. Both techniques had been introduced already in earlier times (*cf.* Möller-Wiering in this volume). Tablet weaves mostly survived in bogs. Those used as starting borders for larger fabrics may be interpreted as more proof of the warp-weighted loom (*cf.* Möller-Wiering in this volume, with further literature).

The majority of preserved textiles are tabbies and 2/2 twills.⁶ Amongst the twills, plain diagonal ones prevail. It must be kept in mind, however, that the fragments from graves are sometimes so small that broken or diamond twills cannot be excluded. The diamond twill variation is well documented among the bog finds. Rare examples of other weave types are rep, half-basket and basket weave, as extensions of tabby, and 2/1 twill. A 2/1 twill from Feddersen Wierde has a starting border, indicating its manufacturing on a warp-weighted loom (Fig. 6.2; Ullemeyer and Tidow 1981, 91). Non-woven fabrics occur several times as sprang and once as twining, the latter again in Feddersen Wierde (Ullemeyer and Tidow 1981, 95–97).

Patterns were created during the weaving process by alternating the twist direction of the yarn, by using certain bindings like diamond twill, by varying the bindings or by using colours. Spin-patterned textiles are not as common as diamond twills but are well documented. Alternating variations of tabby combined in one fabric are known from Feddersen Wierde (Ullemeyer and Tidow 1981, 89–90) and Obenaltendorf (see below) in Niedersachsen as well as from Thorsberg in Schleswig-Holstein (see below). Colours are often difficult to recognise but the various bog finds as well as material from the dwelling mound of Feddersen Wierde (Ullemeyer and Tidow 1981, 108–109) prove their use for creating stripes or checks. Moreover, red and blue stripes were observed in a princely burial (*Fürstengrab*) in Neudorf-Bornstein in Schleswig-Holstein (Farke 2004, 40–42), while traces of a red dye-stuff probably deriving from a textile were also noted in another rich grave in Gommern/Sachsen-Anhalt (Becker and Wunderlich 2000, 191). At Fallward in Niedersachsen, various colours were visible in a grave that was not particularly rich, compared



Fig. 6.2. A 2/1 twill from Feddersen Wierde, Niedersachsen, with a starting border (After Ullemeyer and Tidow 1981, 91, Tafel 28:2).

to the above-mentioned burials (Hägg 1998, 431–432; Schön 2008, 50). However, only red was observed on textiles (see below). After weaving, wool textiles could be napped or fulled, both processes obscuring the weaving structure. Napped examples are known from Thorsberg. Moreover, appliqués, embroidery *etc.* could be added for decoration but are almost absent in the material presented here. Only tablet-woven bands and borders play a noteworthy role in this respect as various bog finds prove. Whether the gold threads observed in a *Fürstengrab* in Neudorf-Bornstein in Schleswig-Holstein were inserted during weaving or added later, cannot be ascertained (Abegg-Wigg 2008, 287).

Textiles from Cremation Graves

Cremation burials prevailed in *Germania libera*, both in the Early and in the Late Roman Iron Age. Naturally, this reduced the chances of textile survival. In Schleswig-Holstein and parts of Niedersachsen and Mecklenburg-Vorpommern, most examples belong to the Early Roman Iron Age and were found together with knives, *i.e.* as part of a specific regional burial custom. Apart from one piece, the material is not stated, but linen may be expected as indicated below (Geilmann and Gebauhr 1959, 264–269). Only two tabbies are registered, both in z/z-twist, one from Söndesee (Bender Jørgensen 1986, 230) with 16/9 threads/cm, the other from Bordesholm (Tidow 1986, 123). The latter is somewhat finer, with 15/14 threads/cm, and made of linen. Diagonal 2/2 twills in z/z-twist are known from at least six sites (Hornbek, Segeberg, Kronshagen, Gettorf, Sörup, Norddorf), with thread counts of 12–14/10–12 threads/cm (Bender Jørgensen 1986, 229–230). Spin-patterned textiles with 12–15/11–14 threads/cm are also known from three graves at

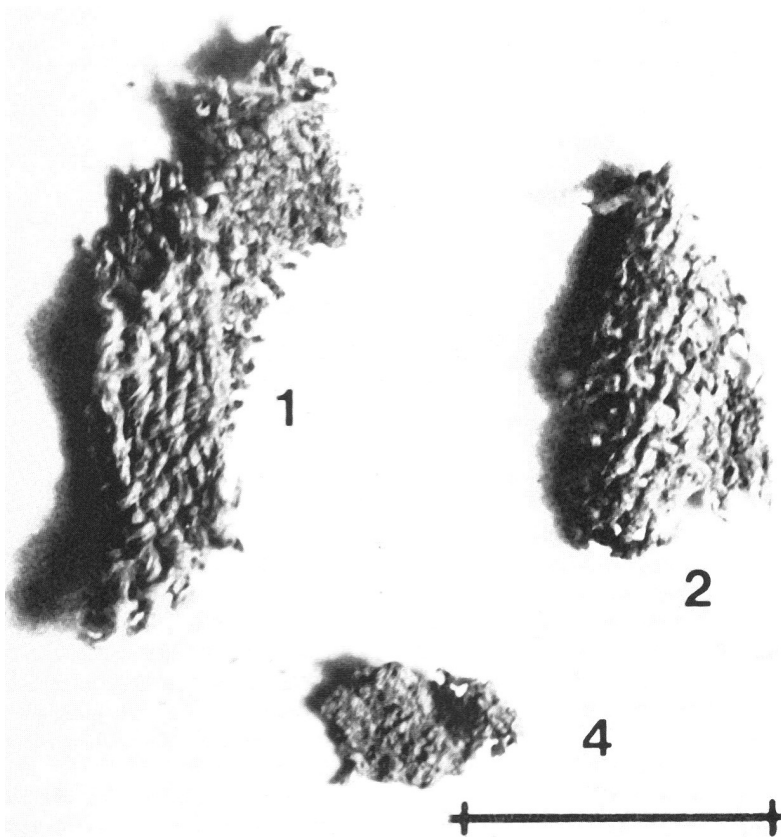


Fig. 6.3. Linen tabby with 15/14 threads/cm, adhering to a fibula excavated in Garlstorf, Niedersachsen (After Tidow 1984, 172, Abb. 2).

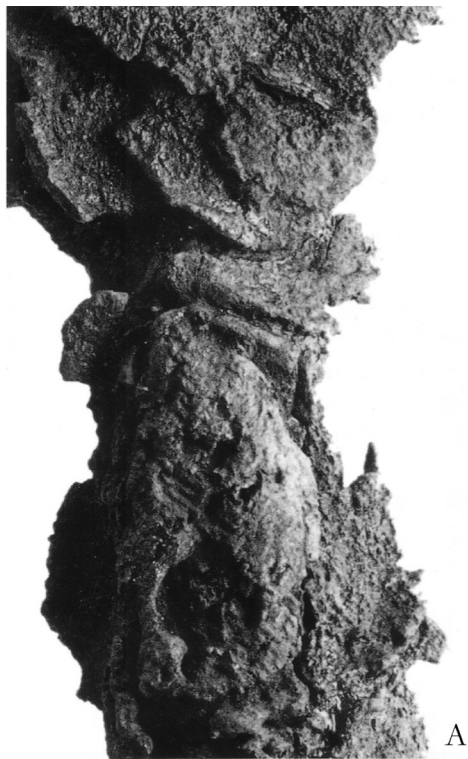
Hornbek. Another three fragments with similar thread counts are broken or possibly diamond twills, one in z/z-twist (Südensee), two in z/s-twist (Rausdorf, Segeberg; Bender Jørgensen 1986, 229–230). Sprang is reported from Segeberg, Norddorf and possibly Sörup (Bender Jørgensen 1986, 229–230).

In Niedersachsen, mainly in period Eggers C, the use of bronze vessels and particularly of Roman situlae (*Hemmoorer Eimer*) as urns helped to preserve some textiles. The textiles either adhere to the outside, reflecting the wrapping of the urn, or to the inside, indicating that the bones were wrapped before they were placed in the vessel (*cf.* Gleba in this volume). The textile material is very homogeneous, mostly consisting of tabbies in z/z-twist and made of linen. The thread counts of the tabbies are fine to often very fine, ranging from 18/16 threads/cm up to 44/26 threads/cm. Examples come from Helzendorf (Geilmann and Gebauhr 1959, 263; Schlabow 1972, 16–17;⁷ Bender Jørgensen 1992, 228), Hemmoor⁸ (Waller 1959, 11–13; Geilmann and Gebauhr 1959, 263; Schlabow 1972;⁹ Bender Jørgensen 1992, 228) and Osterholz (Hundt 1976, 61). On one fragment from

Hemmoor, every fifth thread in one system is tripled. Alternating single and multiple threads in one system were also noted on a fragment from Osterholz (Hundt 1976, 60), as well as on one from Helzendorf, the latter, according to Schlabow (1972, 16), s/s-twisted. On four occasions, linen 2/2 twill was identified, *i.e.* a plain one in Barnstorf with 20/15 threads/cm (von Stokar 1938, 117; Bender Jørgensen 1992, 228) and two diamond twills in Hemmoor with 17–18/17–18 threads/cm (Geilmann and Gebauhr 1959, 263; Schlabow 1972, 17; Bender Jørgensen 1992, 228) and in Osterholz with 21/18 threads/cm (Hundt 1976, 59). The fourth item is a plain twill from Hemmoor, on the surface of which fine, loose, silver particles not integrated into the fabric were observed (Geilmann and Gebauhr 1957).

The situation is slightly different in a very rich grave in Putensen where at least three different fabrics were used for the wrapping of metal objects laid down in the urn (Hundt 1972). One is a very fine linen tabby with 32–35/34–36 threads/cm. The second one is a 2/2 twill with about 12/13 threads/cm, reported as wool. An unusual find is the third weave, a 2/1 twill with 12/16 threads/cm. All three textiles were woven in z/z-twist, which is also the case for a linen tabby with 15/14 threads/cm, adhering to a fibula excavated in Garlstorf (Fig. 6.3; Tidow 1984, 171).

As with the above-mentioned examples from Niedersachsen, most textiles known from Mecklenburg-Vorpommern survived inside the urns as wrapping for knives, jewellery and other artefacts. Linen tabbies in z/z-twist prevail again, mainly varying between 11/12–13 and 18/17 threads/cm, with few exceptions higher or lower. Material of this type was found in Badow (Bender Jørgensen 1992, 228–229), Blievenstorf (Just 1964, 313–314; Bender Jørgensen 1992, 229), Hagenow (Just 1964, 316; Bender Jørgensen 1992, 230), Körchow – here used as wrapping for a bucket (Just 1964, 314; Bender Jørgensen 1992, 230), Neubrandenburg (Leube 1978, 33–34), Wiebendorf (Bender Jørgensen 1992, 230) and Wotenitz (Stange 1979, 87, 94–95; Bender Jørgensen 1992, 230¹⁰). Neither are 2/2 twills in z/z-twist rare. On average, the thread count is a little lower than in the tabbies, with counts between 8/5 and 16/16 threads/cm. They were excavated at Badow, Blievenstorf, Pritzier and Wiebendorf (Bender Jørgensen 1992, 228–230), at Neubrandenburg



A

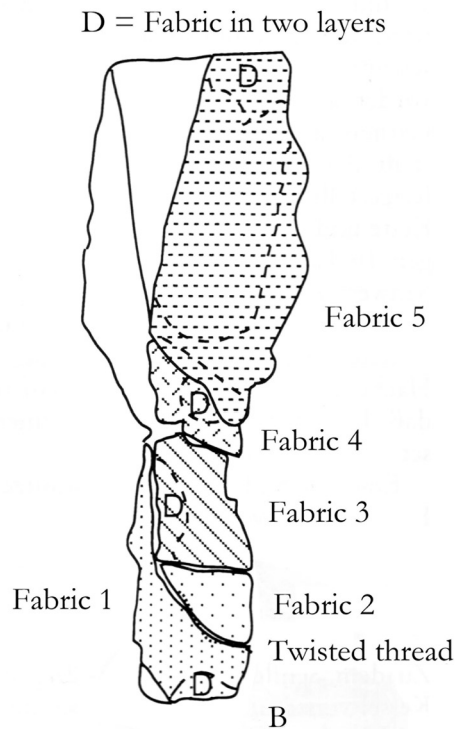


Fig. 6.4. 2/2 twills in z/z -twist from a *Fürstengrab* at Hagenow, Mecklenburg-Vorpommern (After Blumenau et al. 2000, 165, Abb. 13).

(Leube 1978, 34) and in a princely burial at Hagenow (Fig. 6.4; Blumenau *et al.* 2000, 166).

Other weaving techniques are rare in Mecklenburg-Vorpommern. The Badow site also contained a rep (z/z 20/10 threads/cm) and a spin-patterned twill with 10/10 threads/cm (Bender Jørgensen 1992, 229). Spin-patterning is also known from Neubrandenburg and Hagenow. The first item is a tabby with only 8/8 threads/cm (Leube 1978, 34). The other is a very fine twill with 27/26 threads/cm, made of wool (Just 1964, 316; Bender Jørgensen 1992, 230). Moreover, Hagenow revealed a diamond twill in z/s -twist with 16/15 threads/cm, again woven in wool (Just 1964, 316; Bender Jørgensen 1992, 230). A wool 2/2 twill in z/s -twist with 16–17/16–17 threads/cm is reported from Milow (Just 1964, 314; Leube 1978, 34–35).

Very little is known from further south and west. A site from Brandenburg, Kemnitz, is noteworthy with medium fine to fine tabbies and a diagonal 2/2 twill, all made of linen using z -twisted yarns (Geisler 1984, 137–138; Bender Jørgensen 1992, 230–231). Only the thread count of 20/13 threads/cm is determinable on a textile impression from Zauschwitz in Sachsen (Meyer 1969, 135; Bender Jørgensen

1992, 231). Another impression derives from a z/z -twisted tabby with 24/22 threads/cm, probably in linen, reported from Kleinlangheim in Bayern (Hundt 1978, 113).

Textiles from Inhumation Graves

Although cremation burials dominated in *Germania libera*, inhumations also existed and became more common from the 3rd century AD onwards. As they often contain rich equipment, frequently of Roman provenance, some of them are regarded as princely burials or *Fürstengräber*, intended for individuals of high rank (*cf.* Banck-Burgess in this volume). Although they seem a promising source of textiles, only very little material is preserved.

In Neudorf-Bornstein in Schleswig-Holstein, a *Fürstengrab* contained some gold threads (Abegg-Wigg 2008, 279), while in a nearby similar grave, stripes in red and blue on a plain 2/2 twill were observed (Farke 2004, 40–42). The coarse to medium-fine twill fragments in z/s -twist consisted mainly of wool but the bluish threads appear to be of plant origin. The textiles were found inside the coffins (Schäfer 1968, 51). Moreover, according to Hans-Jürgen Hundt (1976, 64), a diamond twill was preserved in a vessel (*Hemmoorer Eimer*) in the first mentioned burial. Both are male graves

dated to the 3rd century AD (Abegg-Wigg 2008, 279, 281–282).

Another Late Roman *Fürstengrab* was opened at Gommern in Sachsen-Anhalt. A wooden box at the feet of the deceased contained a red substance together with a leather belt decorated with gold (Becker and Wunderlich 2000, 191, 195, 199). The red colour most probably derived from a madder-dyed textile. The third find worth noting is a 3rd-century AD burial at Haßleben in Thüringen, which contained a diamond twill (Hundt 1976, 64).

Other inhumation burials are known from sites along the North Sea coast of Niedersachsen, dated from c. AD 300 onwards (Hägg 1998, 431; Schön 2008, 108). Interesting results can be reported from Fallward, in the neighbourhood of the settlement Feddersen Wierde, where in the oldest burial apricot, pink, red, yellow, white, blue and violet were visible as textile colours, although the fabrics themselves had mostly disintegrated (Hägg 1998, 431–432). The costume probably consisted of a red tunic with sleeves, a white scarf with coloured borders reaching from the head to the hips and a twill cloak, while a gauze-like weave was laid over the body. The child buried in a slightly later grave lay on a z/s-twisted 2/2 twill, while on top a fine diamond twill in z/z-twist was observed and interpreted as a possible upper garment. Probably, she wore a red undergarment with sleeves which was made in tabby. Many fragments of reddish sprang were found distributed from head to foot, some of which were interpreted as stockings (Kadereit 2005, 14–15). A woman living around AD 400 was buried in a twill-woven upper garment closed with two fibulae at the shoulders (Moll 2001, 3, 90–91). Above this lay a plaited textile. Probably, a linen undergarment in tabby supplemented her dress.

Excavations at Sievern and Flögelin-Voßbarg in Niedersachsen (Tidow 2001), Mahndorf in Bremen (Schlabow 1953)¹¹ and Ketzendorf near Hamburg¹² yielded material from the 4th and 5th centuries AD.¹³ Twills in either z/z or z/s-twist, typically made of wool prevail. The thread count varies between about 10/10 threads/cm and 16/12 threads/cm. Mahndorf further contained a medium fine z/z tabby in linen, a rep,¹⁴ a possible sprang and two unusual, though plain twills: one is spin-patterned with 9–10/8–9 threads/cm, the

other was woven with doubled threads in one system (12/9 threads/cm). Other finds are two tablet weaves, probably side borders, one from Sievern, the other from Flögelin-Voßbarg.

Further east, in Gnoien in Mecklenburg-Vorpommern, a rather coarse twill came to light, woven in z/z with 9/7 threads/cm, and dated to period B1 or the 1st century AD (Just 1964, 311–312; Bender Jørgensen 1992, 229–230). A similar fabric, along with two tabbies in z/z-twist were found at Gießmannsdorf in Brandenburg, dated to period C (Bender Jørgensen 1992, 230); one of the latter is a very fine linen with 25/22 threads/cm. Five sites with textile finds may be mentioned from Sachsen-Anhalt. Fine linen tabbies in z/z-twist were excavated at Wansleben and Trebitz, while medium fine tabbies of uncertain material were found at Trebitz and at Braunsbedra, dated to period B2–C3 (Schmidt 1963, 486; Bender Jørgensen 1992, 231). A possible twill in linen from Pretzsch is mentioned by Georg Buschan (1889, 21), dating between the 4th and 6th centuries AD. A twill from Vitzke is reported as being red (von Stokar 1938, 126).¹⁵ Finally, a wool tabby in z/z-twist with 14/16 threads/cm from Kleinlangheim in Bayern may be added to the list (Hundt 1978).

Textiles from Bogs

Many textile finds from Germania libera survived in bogs, often in connection with bog bodies. All finds were discovered many decades or even more than a century ago and most of the research into the textiles is outdated and requires revision. Therefore, not all of this material will be considered here. Instead, the focus is on ¹⁴C-dated bog bodies. An overview of the long-standing academic discussion on how to interpret the cultural context of the phenomenon of bog bodies is given by Michael Gebühr and Sabine Eisenbeiss (2007).

The textiles preserved in bogs are made of wool.¹⁶ Most probably, this is only a matter of preservation. Recent research on the Danish Huldremose body has demonstrated that undergarments of plant fibre cannot be ruled out (Gleba and Mannering 2010; Mannering and Gleba forthcoming and Mannering *et al.* in this volume). This observation might be an explanation for the reported unclothed state of certain bog bodies, sometimes covered with or wrapped in a cloak, sometimes with other garments deposited beside them. Examples are

the Damendorf Man and the Hunteburg Men (Mestorf 1900, 10; Schlabow 1976, 17–18).

Three bog bodies pertinent to this discussion were discovered in Schleswig-Holstein. Two somewhat different calibrated ¹⁴C dates were obtained for the Rendswühren Man, AD 135–255 and AD 305–315 (van der Plicht *et al.* 2004, 484–485). His cloak with red stripes was made of 2/2 diagonal twill woven in z-twisted yarns. The thread count is about 7/6 threads/cm. Two tubular and one plaited edge are preserved (Schlabow 1976, 60–61).

The Damendorf Man (unearthed in 1900) was dated to cal AD 135–335 (van der Plicht *et al.* 2004, 483). His cloak was heavily repaired, and is a diamond twill in z/s-twist with about 8/10 threads/cm (Schlabow 1976, 54–55).¹⁷ According to Karl Schlabow, all four edges are tablet-woven with few tablets. The same is noted for the cloth from which the man's trousers were cut (Stettiner 1911, 31–32; Schlabow 1976, 77–78). The weave is again a diamond twill in z/s-twist,¹⁸ but a little finer, with 11/11 threads/cm. Moreover, two leg wrappings belonged to the man's costume (Mestorf 1900, 12; Schlabow 1976, 88). They are ready-made pieces with tubular selvages. The weave is described as diagonal twill in z/z-twist with a thread count of 13–14/9 threads/cm.¹⁹

While the human remains of the Dätgen body have not survived, the textiles belonging to it still exist and were dated to cal AD 345–535 (van der Plicht *et al.* 2004, 483), *i.e.* they possibly date later than the Roman Iron Age. The clothes are described by several authors (Mestorf 1907, 18–19; Stettiner 1911, 38; von Stokar 1938, 123–124; Schlabow 1976, 55–57, 78–79, 92–93). The main garments – the cloak and the knee-length trousers – are made of plain 2/2 twill in z/z-twist. The thread count of the much repaired cloak is only 7–8/6 threads/cm, while the trousers are a little finer with 10/8 threads/cm. The starting and finishing border of the cloak are tablet-woven, while the side edges are tubular. These features reoccur on the trousers. A tablet-woven band probably used as a belt has broad stripes of alternating colours in the weft direction.

The following finds are from Niedersachsen.²⁰ The calibrated ¹⁴C date for the bog body of Marx-Etzel is AD 45–125 (van der Plicht *et al.* 2004, 483). The clothing encompasses a sleeveless tunic, knee-length trousers and a

piece of unknown function (Hahne 1919, 14–17, 21; Schlabow 1976, 72, 79–80). The 2/2 twill of the tunic²¹ has a z-twisted warp running from head to foot. The s-twisted weft ends at least on one side in a tubular edge, integrated into a seam running down along one side of the body. The trousers are tailored from one piece of cloth, an irregular diamond twill in z/s-twist with broken and diagonal sections towards the edges. Schlabow gives the thread count as 12/10 threads/cm. The last piece which is not included by Schlabow, consists of two layers, both half-basket weaves in z/2z, one with 10/22 threads/cm, the other with 6/22 threads/cm. The only preserved selvedge is reinforced by two groups of warp threads.

The most probable dating of the Marx-Stapelstein body is AD 135–385 (van der Plicht *et al.* 2004, 483). The textiles found with the body consist of only small fragments with many repairs (Hahne 1919, 47–48). All of them, *i.e.* two tabbies, four half-basket weaves and one 2/2 twill, are woven of z-twisted yarn. One extended tabby has blue stripes (von Stokar 1938, 121). The selvages of two extended tabbies are made with two warp bundles each.

The bodies of two men lying side by side were discovered in 1949 at Hunteburg. The calibrated ¹⁴C dates vary between AD 245 and 415 (van der Plicht *et al.* 2004, 484). Their cloaks in plain 2/2 twill are preserved (Schlabow 1976, 51–53), one woven in z/s with 12–13/7 threads/cm, the other in z/z with 11/8 threads/cm. Both have tablet-woven edges all around. Their structure, however, requires a re-examination.

The calibrated ¹⁴C date for the Obenaltendorf body is AD 260–380 (van der Plicht *et al.* 2004, 483). His clothes were analysed by Hans Hahne (1919, 29–41) and more recently by Susan Möller-Wiering (2007).²² The cloak, tunic and knee-length trousers are all half-basket weaves made of z-twisted yarn. The cloak has 7/17–18 threads/cm (*i.e.* 9 pairs/cm) in the weft. Along the sides, it is edged with two bundles of warp ends, while at the upper and lower end, the warp threads continue as fringes without any kind of border. Some dark, S-ply yarns form narrow weft stripes close to these ends. The sewing pattern of the sleeveless tunic is similar to that from Marx-Etzel, although here with doubly reinforced selvages. The weave with 11/23 threads/cm is supplemented by some stripes

in rep. The tunic may have been made from a former cloak. The re-use of an older garment, probably a tunic, seems to be the case for the trousers as well. On the ground weave with 11–12/19 threads/cm, some dark stripes in rep resemble *clavi*. The side border is of the doubly reinforced type, the finishing border is plaited. Reinforced side edges and twined starting and finishing borders are to be found on possible knee bindings woven in z/z-twisted tabby, with 13/14 threads/cm (Fig. 6.5). The half-basket weave, edges and decorations indicate that the textiles from Obenaltendorf were produced within the Roman Empire, possibly in Italy, as a far-reaching search for parallels has shown (Möller-Wiering 2007).

Three bog finds from Niedersachsen are to be added here, all single finds not associated with bog bodies. The Vehnemoor cloak was wrapped around a Roman bronze bowl. The 2/2 diamond twill in z/s-twist with 12–13/9–10 threads/cm is reduced to broken twill towards the edges, which are trimmed with very broad tablet weaves, using over 100 tablets (Schlabow 1952–53, 174–179; Möller-Wiering and Ræder Knudsen in press). Dye tests indicate a bright violet for the ground weave but natural wool colours for the stripes in the tablet weaves (Fischer 2000, 14).

The tunic from Reepsholt has been described repeatedly (Fuhrmann 1941–42; Potratz 1942; Wild 1968, 169; Schlabow 1976, 73–76).²³ Although no ¹⁴C dating exists, the tunic may be dated to the Early Roman Iron Age. The weave is a plain 2/2 twill with 10–11/10 threads/cm. The warp is z-twisted while wool yarns of different colours and different spinning directions create regular, narrow stripes in the weft. The entire tunic, including the long sleeves, was woven to shape: it started with a tablet-woven border along the opening of one sleeve, was widened to form the body part, and narrowed again for the other sleeve. Thus, the warp runs horizontally across the tunic as in the Roman weaving tradition. Each selvedge is reinforced with one bundle of warp ends. Very narrow, red, tablet-woven bands are sewn to the neck opening and the arms.

A bog near Strückhausen preserved a piece of wool cloth with 28 fibulae attached to it (von Buttel-Reepen 1930, 64), a possible hoard or a sacrifice, deposited in the last quarter of the 4th century or around AD 400. The

half-basket weave according to a photograph, is very fine.

Textiles from Weapon Deposits

Weapon deposits are interpreted as sacrifices after a battle. Two sites with textiles are known from Schleswig-Holstein. Gremersdorf-Techelwitz, probably dating to period C1 (Bemmann and Bemmann 1998, 1:336), contained only a few iron weapons. The fabrics on their surfaces are hardly identifiable. Nevertheless, they are noteworthy as an example of the wrapping of weapons during the rituals preceding their deposition (Möller-Wiering 2011).

At Thorsberg, the main deposition dates to the 1st half of the 3rd century AD (Lund Hansen 2003, 88–89, with Fig. 6.4). Several pieces of wool clothing survived and have been subject to examination on numerous occasions (*e.g.* Engelhardt 1863; Mestorf 1900; Schlabow 1976; Farke 1994). Karl Schlabow published several texts about this material, ultimately summarised in his book of 1976. A new investigation (Möller-Wiering 2011; Ræder Knudsen 2011) revealed further insights. Isotope analyses on some samples mostly indicate a local or regional origin, while a very coarse tabby in s/s-twist comes from an area with crystalline rocks not present locally (von Carnap-Bornheim *et al.* 2007).

Two pairs of trousers with integrated foot-pieces from Thorsberg as well as a tunic were made of diamond twill in z/s-twist with about 17/14 threads/cm. Narrow, tablet-woven, transverse borders are preserved on all three garments. The side edges on the red-dyed tunic are reinforced with one warp bundle each. The tunic was not woven to shape but tailored with attached sleeves. The wrists are decorated with colourful tablet-woven bands and the seams along the sides were probably embroidered with thin blue cords. The attached foot-pieces (Fig. 6.6) were interpreted as an indication of a riding costume by some (*e.g.* Hägg 2000, 29), while others argue against this idea (see discussion in Möller-Wiering 2011).

Cloaks are generally defined by their large size, of about 1.6 × 2.4 m, and their rectangular shape and/or by the presence of broad tablet-woven borders, often in various colours. While Karl Schlabow described the borders on the Thorsberg items as woven together with the ground weaves, new investigations

demonstrated that they were attached later. Moreover, not all of the seven cloaks were produced on a warp-weighted loom, but rather on a two- (or three-) beam loom most probably with a tubular warp (Fig. 6.7). The ground weaves are plain 2/2 twills in z/s-twist with 9–14/8–12 threads/cm, often striped or checked.

Most fragments of unknown function from Thorsberg represent similar qualities as those just described. One very fine 2/2 twill is spin-patterned. Three coarse, or even very coarse, tabbies were woven in either z/s or s/s-twist. A coarse tabby in z/z has a broad stripe in z/s; narrow tablet weaves constitute the edges along three sides. This piece is 13.5 cm wide and originally more than 77 cm long, and is interpreted as a leg wrapping. Another leg wrapping is similar in size and is unique because the 2/2 twill is woven in s/s-twisted yarn, while the thread count of 16/16 threads/cm matches the generally good qualities found at Thorsberg. The only 2/2 twill in z/z-twisted yarn (8/12 threads/cm) is irregularly broken.

Textiles from Settlements and Other Contexts

As indicated by the many examples mentioned in the section about materials, tools and techniques, the dwelling mound of Feddersen Wierde on the North Sea coast of Niedersachsen contained hundreds of various textile fragments, published in 1981 by Rudolf Ullemeyer and Klaus Tidow. They cover the entire Roman Iron Age. While all woven and plaited types of fabrics known from *Germania libera* were registered at this site, 92 % consist of tabbies and diagonal twills (Ullemeyer and Tidow 1981, 86), mostly in z/z. Half-basket and basket weave are only present as decoration in combination with other bindings. The thread counts range from very coarse to very fine but are generally slightly lower than in textiles from graves. Various starting, finishing and side borders, including narrow tablet-woven and tubular edges, complete the picture. Almost all fabrics are made of wool. Only two pieces, a coarse but patterned fabric in extended tabby (Ullemeyer and Tidow 1981, 128) and a very fine 2/2 twill (Ullemeyer and Tidow 1981, 132), were determined as linen. Nevertheless, the finds of stems and broken seed capsules prove that flax was cultivated at the site (Körper-Grohne 1988, Tafel 109).

Tofting is another dwelling mound on the North Sea coast, in Schleswig-Holstein. The few textiles found there, which date to the 3rd century AD were published by Karl Schlabow in 1955 and recently re-examined by Susan Möller-Wiering (2009). All five items are 2/2 twills made of wool. The twist direction is mostly z/s, once s/s; two pieces are broken or diamond twill variants and the thread counts vary.

On the Roman-Germanic battlefield of Kalkriese, dated to AD 9, three fabrics were discovered (Mitschke 2009). Two adhere to metal fittings and one covers a coin (Figs 6.8–6.9). The thread counts are given as 10–12/10–12 to 18–21/18–21 threads/cm. A piece with 15/14 threads/cm was unearthed in Bergisch-Gladbach in Nordrhein-Westfalen, not far from the Rhine, together with a coin deposit of the 4th century AD (Bender Jørgensen 1992, 231). Two textiles with 16/16 and 22/22 threads/cm are known from Breslack in eastern Brandenburg (Bender Jørgensen 1992, 230). All textiles were determined as tabbies in z/z, generally (probably) made of linen. They are dated to the Late Roman Iron Age.

A few threads of silk and gold were identified on a fibula of the 3rd century AD at Unterhaid in Bayern (Peek 1996, 124). The site is a settlement, but the context of the fibula is unclear and a burial cannot be excluded.

Roman Provinces

Materials, Tools and Techniques

While many of the materials, tools and techniques used in the Roman provinces are the same as those in *Germania libera*, there are some distinct differences in the data provided by archaeological and other sources. The sheep wool in the Roman provinces within Germany seems to have been the same as during the Iron Age. This type of sheep resembles the breed still existing on the Orkney Islands (Wild 2009, 53). However, the Romans may have introduced other varieties of sheep. Michael L. Ryder analysed 53 samples from Xanten (Nordrhein-Westfalen; 4 items), Saalburg (Hessen; 2) and Mainz (Rheinland-Pfalz; 47), which were finer than samples from Vindolanda near Hadrian's Wall in Great Britain (Ryder 1981, 102). The relation between a sheep fleece and a textile is, however, not straightforward, because of the wool processing (Wild 2009, 52). Felt making

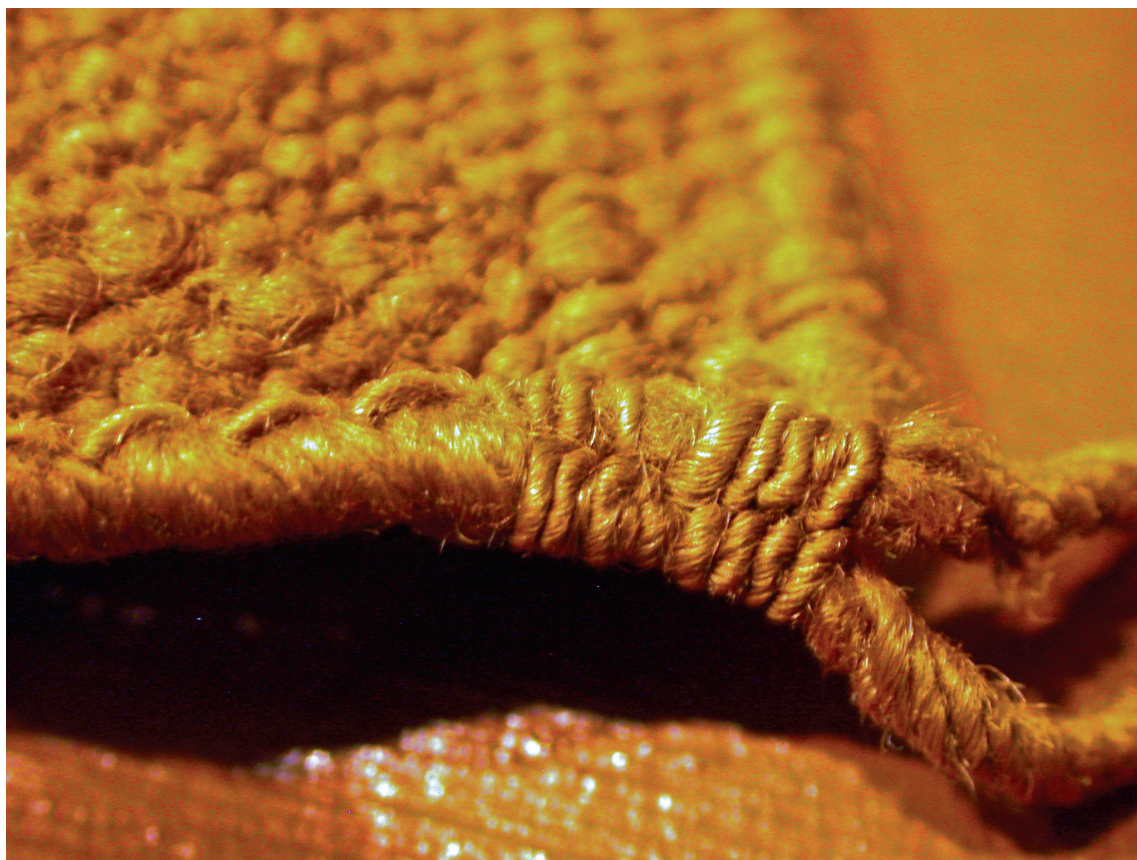


Fig. 6.5. Possible knee bindings from Obenaltendorf, Niedersachsen, with reinforced side edges and twined starting and finishing borders (Photo: S. Möller-Wiering).



Fig. 6.6. The attached foot-piece from Thorsberg, Schleswig-Holstein, 3685 (Photo: S. Möller-Wiering).

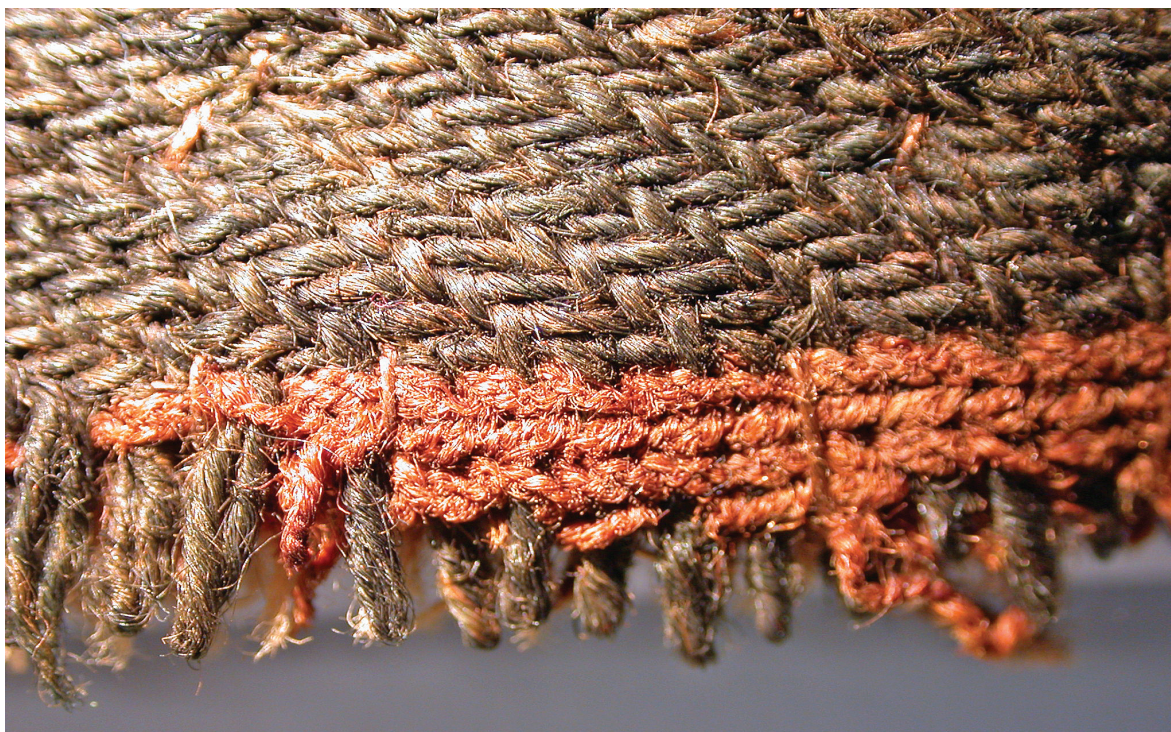


Fig. 6.7. Starting border on cloak 3686 from Thorsberg, Schleswig-Holstein (Photo: S. Möller-Wiering).



Fig. 6.8. Coin with textile from Kalkriese, Niedersachsen, AD 9 (© rem, Mannheim).

Fig. 6.9. Detail of the textile on the coin from Kalkriese, Niedersachsen, 9 AD, in the SEM (© CEZA, Mannheim).

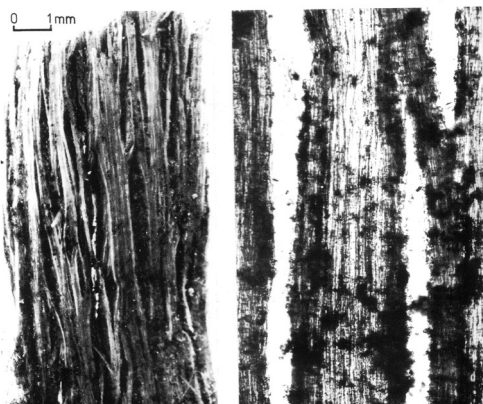
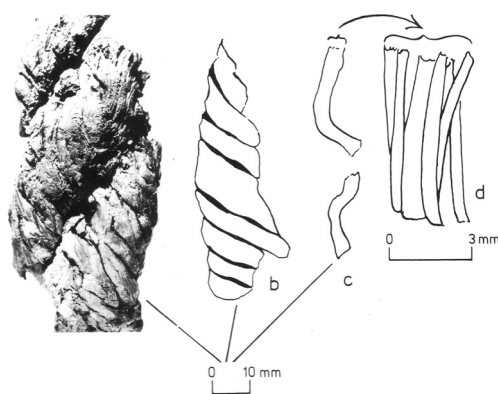
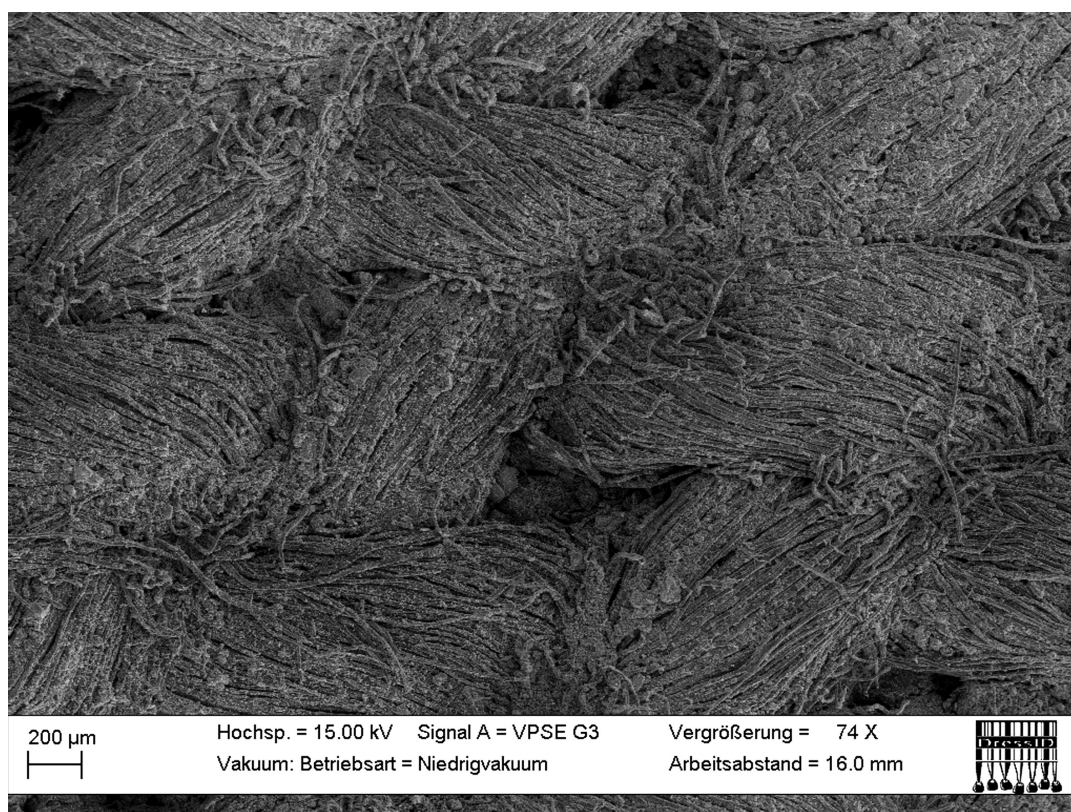


Fig. 6.10. Esparto, found in the Rhine harbour of the Colonia Ulpia Traiana, modern Xanten, Nordrhein-Westfalen (After Gaitzsch 1986, 25, Abb. 39).

is assumed to be common in the north-west provinces, but actual finds are lacking (Wild 2009, 54).

Fragments made from goathair were identified among wool textiles from Cologne. One fabric is possibly made of camel hair. These finds, however, are unique (Laurenze 1982).

The wool was combed and many iron wool combs with rows of teeth on both narrow sides have been found in the north-west provinces (e.g. Rieche and Schalles 1987, 58). These implements are sometimes mentioned as flax processing tools (Fischer 1990, 177, pl. 44, 22 and 180, pl. 50.1; see also Schmidts 2004, 59 with further literature), while John Peter Wild (2009, 54) describes their use in wool preparation.

The relative scarcity of linen textiles is a result of unfavourable conditions of preservation. Most of the plant fibre finds come from graves. However, there is evidence of flax cultivation compiled by Walter Dörfler (1990). One building structure at Prüfening (Bayern) is assumed to have served for drying flax and/or other products (Dreisbusch 1994).

Iron flax hackles (*Flachskämme*) were found inside this building (Fischer 1990, 88, 174 and 179). Furthermore, literary evidence of linen production and trade in Roman provinces has been collected by Astrid Böhme-Schönberger (2000).

There are a few examples of the use of hemp among the Roman finds from Germany (Saalburg castle, Hessen; Jülich, Nordrhein-Westfalen; Alzey, Rheinland-Pfalz). Most of them are ropes (Wild 1970b, 17, 110; Rieche and Schalles 1987, 75; Böwing and Paffgen 1995), and it is unclear if hemp fibre was ever used for making textiles. Esparto, native to some areas of the Mediterranean was found in the Rhine harbour of the Colonia Ulpia Traiana, modern Xanten in Nordrhein-Westfalen (Fig. 6.10; Gaitzsch 1986, 25). Another interesting find is a rope from the civilian settlement at Rainau-Buch (Baden-Württemberg), which was made from oak bast (Gaitzsch 1986, 27).

Cotton is very rare north of the Alps and only two finds are reported. One was found with a hoard of 501 coins dating to AD 300 at Dillingen-Pachten, Saarland (Franke 1969). The other came to light in a rich burial at Rommerskirchen (Nordrhein-Westfalen, see below).

Silk was imported to the Roman provinces from the Near East or China, although De Jonghe and Tavernier (1978) suggested the production of some silk textiles in the Western Roman Empire in Late Antiquity, using a special horizontal loom (see also Wild 1987). The main evidence is a weaver's mark embroidered on a silk fabric from the grave of St. Paulinus at Trier (Rheinland-Pfalz) and containing a Latin inscription which points to manufacture in the West (Wild 1982, 18). Some Late Antique silks have survived in church treasuries, but they will not be considered here, since they probably reached Germany in post-Roman times (Wild 1987, 22). Silk finds have also been recovered in the graves at Wehringen, Bayern, and St. Maximin at Trier (graves 35 and 279; see below).

Wild silk is reported in a grave at Rommerskirchen (Schrade and Stauffer 2007, 145) and a grave at Weilerswist-Klein-Vernich (Stauffer 2005, 114), both situated in the vicinity of Cologne (Nordrhein-Westfalen). In both finds, the wild silk is combined with gold threads.

Gold thread is generally found in the rich

graves in the Late Antique cities, sometimes in an ecclesiastical context. They are generally connected with rare fibres such as cashmere, cotton, silk or wild silk (Schrade 2009). The finds are concentrated at Mainz, around Cologne and along the river Mosel. The majority derive from sarcophagi, three are from cremation burials, others are from wooden coffins and one from a lead coffin. Based on the grave furnishings, all the deceased were women with the exception of St. Paulinus' grave in Trier which is connected to a male saint. The function of the gold thread is not always apparent. Some gold threads clearly belong to headgear, others were found at the knees or the feet. Most gold-woven textiles probably were shrouds that covered the deceased.

Gold threads are most often made of an organic core and cut gold sheet strips (*Goldlahn*) wound around the core. One cremation grave at Mainz-Weisenau (Rheinland-Pfalz) dated to the 1st century AD contained threads made of gold strips z-twisted around the core which were subsequently plied (Hofmann 1990). In St. Paulinus' grave at Trier only flattened gold wire was found and no signs of an organic core strip were visible under the microscope (Schneider 1884, 171), suggesting a different type of gold thread. In St. Aldegund's Church (Rheinland-Pfalz), silver and gold brocade was noted (Haberey and Röder 1961, 131).

The grave at Rommerskirchen (Nordrhein-Westfalen) contained a frontlet with a hairnet of gold thread in sprang technique. It was decorated with small gilded plates and tubes and beads of white, green and dark blue glass. Other gold threads were found in the same grave proving the existence of a second gold-woven textile (Schrade and Stauffer 2007). In Mainz (Zahlbacher Weg), a band with gold threads adorned the head of the deceased (Kessler 1925). Graves 3 and 5 in Augsburg (Bayern) in the so-called "Pfarrgarten" of St. Ulrich and Afra also yielded gold threads (Pohl 1977). In grave 3, the *Goldflitter* was near the left knee, and in grave 5 near the head, found together with hairpins. Hans-Jürgen Hundt (1989) published the gold threads from cremation grave 3639 at Krefeld-Gellep (Nordrhein-Westfalen). This cemetery belonged to the military camp of Gelduba and continued to be occupied into the Migration period. As in the case of Rommerskirchen, small gold tubes were found, but they were folded from small

rectangular gold sheets and were triangular in the cross section. Furthermore, gold threads were found in a lead coffin in Lommersum-Bodenheim, Nordrhein-Westfalen (Ullemeyer in Wortmann 1970). At Rheinbach-Flerzheim near Cologne, Nordrhein-Westfalen, a sarcophagus containing many precious grave goods including gold jewellery and a game board with ivory inlays was excavated and dated by coins to AD 275/6 (*terminus post quem*). The deceased was wrapped in gold brocade (Gechter 1990).

The single find of some asbestos fibres is known from a wooden coffin (grave P.102) found at the eastern side of St. Severin's Church in Cologne, Nordrhein-Westfalen (Binsfeld 1962–63, 155; Wild 1970b, 21).

The yarns in most cases are z-twisted. Only 35 textiles are known to contain s-twisted yarn. Out of these, there are only five textiles made from s-twisted yarn in both directions. One is probably made of cotton (Franke 1969) and one of camel hair (Schleiermacher 1982; Laurenze 1982). Two, probably linen pieces are from the Late Antique grave 1351 from Krefeld-Gellep (Nordrhein-Westfalen). They are both tabbies but differ in the density of the threads, having 12/12 and 10/36 threads/cm respectively (Hundt 1974). The latter is a coarse herringbone twill from Mainz (Wild 1982, 13). All s/s textiles are assumed to be imports from the Eastern Mediterranean or Spain (Bender Jørgensen 1992, 128).

Six finds are spin-patterned. Most of them are of medium-fine qualities. In one fragment, the yarn changes in both warp and weft. Three diamond twills from Mainz have plied threads every sixth warp thread. Six other weaves with plied threads are from Mainz, too. Most of them have a rather low thread count of between 8 and 12 threads/cm in both directions (Bender Jørgensen 1992, 233; Wild 1970b, 108; Wild 1982; Streiter 1988).

Much is known about the colour of textiles in the Roman Empire from written and iconographic sources. Moreover, some inscriptions indicate the existence of professional dyers in the provinces (Schumacher 2001, 148; Wild 2009, 60). On the gravestone of a cavalryman found near Dienheim (Rheinland-Pfalz), traces of paint still visible when it was discovered provide an idea of contemporary textile colours (Junkelmann 1992, 49; also cf. Wild 1985a,

408). Yet, there is little evidence of the original colour of the archaeological textiles. Many textiles seem to be undyed. Instead, they have visible decorative stripes (Wild and Bender Jørgensen 1988, 79; Bender Jørgensen 2006), created using either dyed or naturally pigmented wool. Some fabrics from Weilerswist-Klein-Vernich (Nordrhein-Westfalen) made of wild silk and cashmere were dyed blue (Stauffer 2005, 114). In the graves of St. Maximin and St. Paulinus at Trier (Rheinland-Pfalz), the colours were still visible and true purple was identified (Dreyspring and Schrenk 2007; Schrenk 2007).

Spindle whorls are very common among the archaeological material from Roman settlements in Germany (e.g. Lenz 1999). The finds of distaffs, on the other hand do not reflect their former frequency, but rather the regional burial customs. They are concentrated in graves of the Rhine-Meuse area and are frequently crafted from precious materials such as amber, jet and ivory (Gottschalk 1996; cf. Gostenčnik in this volume).

The loom weights found in nearly every Roman settlement indicate that weaving in the area was accomplished on a warp-weighted loom. However, in contrast to Germania libera where rows of weights were found in pit houses, in Roman provinces they generally occur as isolated finds in settlement rubbish layers. Roman loom weights are truncated pyramidal or conical in shape. At Stettfeld (Baden-Württemberg) a spherical weight was dated to the Roman period (Knötzele 2006, 143) and Hermann Ament (1965) noted a decorated specimen. A lead weight from Stolberg (Nordrhein-Westfalen) has the form of a truncated pyramid and weighs 284 g (Löhr and Zedelius 1980).²⁴

Other direct evidence for the loom types used is lacking. Textiles are of little use here since very few borders are preserved. John Peter Wild assumed the introduction of the two-beam loom at the beginning of the Common Era, but there is no evidence for it in the archaeological record of Roman Germany. Pictorial representations indicate tapestry weaving. This technique was possibly used in Roman Germany, but most finds are not very elaborate (Wild 1982, 15).

The finds of some block damasks prompted a discussion of the Roman horizontal loom and its evolution (De Jonghe and Tavernier 1977–78;

Wild 1987). While the technique was developed in the eastern Mediterranean, De Jonghe and Tavernier (1977–78) suggested a production centre at Trier (Rheinland-Pfalz). A special implement is a socket-toothed terminal, whose probable use was to keep cloth or leather under tension (Wild 1985b). Goethert-Polaschek (1983) published tools from the Trier area such as wool combs, distaffs and *Filetnadeln*, which are assumed to be weaving shuttles.

A remarkable concentration of weaving implements including pinbeaters, a triangular weaving tablet, wool combs, sewing needles, weaving batten and other tools was found at Ladenburg (Baden-Württemberg), which is situated close to the Rhine on the eastern shore, but still occupied by Romans in Late Antiquity (Schmidts 2004, 59–61). Workshops for fulling, cleaning and dyeing such as the well-known *fullonicae* at Ostia and Pompeii (Italy) have not yet been identified in the Roman provinces in Germany. However, some basins were excavated in a building at Schwarzenacker an der Blies (Saarland) and interpreted as part of a *fullonica* (Kolling 1972, 252), although at other locations in that region similar basins were interpreted as connected to wine production. A possible dyer's workshop at Xanten is mentioned by Horn (1987, 181). The finishing of textiles is documented by 14 textiles from Mainz (Rheinland-Pfalz), which have a soft finish, possibly due to the process of raising and trimming the nap (Wild 1982; Böhme-Schönberger 2009, 13).

Sewing activities are attested by the vast quantity of sewing needles found in settlements as well as graves. One such item was found in a box in a grave in St. Matthias at Trier (Rheinland-Pfalz) with the sewing yarn still wound around it (Kasperek and Wilhelm 2001).

Textile Manufacture and Trade

The organisation of the textile production in the Roman provinces is not fully understood as yet. The entire process was divided into many steps performed by different professionals, as demonstrated by the names of occupations recorded in literary and epigraphic sources (Schwinden 1989; Böhme-Schönberger 2009, 86). While the inscriptions and pictorial sources from Roman Germany are less helpful for understanding the processing of fibres and textiles, they are more informative about

the structure of the industry as a whole. The professionals and their businesses are often named on the gravestones. Especially in the region around Trier, there are many funerary stone monuments depicting the scenes of the professional life of the deceased. The most famous of these monuments is the Igel Monument situated on the river Mosel near Trier, Rheinland-Pfalz. Its height of 23 m is imposing and demonstrates the prominence of its donors, the Secundinii family. The monument depicts the scenes of cloth trade and transport (Fig. 6.11a–b), although regrettably, the only scene with textile manufacture is partially destroyed. However, it attests to the pivotal role of the Secundinii in the areas of organisation and trade within the textile production process (Zahn 1968, drawings; Drinkwater 1978; Cüppers 1984, colour reconstruction).

A *gynaecaeum*, a place where women produced textiles, at Trier is documented in written sources (*Notitia dignitatum*, Wild 1976). John Peter Wild argued for spinning as constituting domestic production and weaving as occurring in centralised workshops. All gold textiles were probably imports from the eastern Mediterranean (Schrade and Stauffer 2007, 145), either as complete fabrics or as gold threads, although some scholars considered a production of brocade at Trier (Wild 1987, 470–471). The exact meaning of *barbaricarii* mentioned in the *Notitia dignitatum* at Trier is not clear. One part of their business may have been the manufacture of gold-brocaded textiles (Luik 2003, 252).

Apart from this documented centre of textile production, there are some scattered inscriptions mentioning textile professions from Augsburg in Bayern (Böhme-Schönberger 2000), Rottenburg am Neckar in Baden-Württemberg (Gaubatz-Sattler 1999, 373 and 423), Cologne in Nordrhein-Westfalen Alzey (Wild 1970b, 82), and Bad Kreuznach in Rheinland-Pfalz (Schumacher 2001, 141). A noteworthy group of finds best known from Austria (*cf.* Gostenčnik in this volume) are the small lead tags known as *tesserae plumbeae* with inscriptions mentioning client names, garments and prices (Römer-Martijnse 1990). A very few examples are known from Kempten and from Forggensee, both in Bayern and close to the Austrian border (Krämer 1957, 60 and 71; Römer-Martijnse 1997).



Fig. 6.11a–b.
Reconstruction of
Igel Monument,
Trier, Rheinland-
Pfalz (Rheinisches
Landesmuseum, Trier).

Some loom weights from the Roman castle Köln-Alteburg (Nordrhein-Westfalen), the headquarters of the Rhine fleet (*classis germanica*) have been connected with sailmaking. This is partly based on two gravestones of *velarii*, sail

makers (Carroll and Fischer 1999, 567–568). However, textile and cord fragments are very scarce at Köln-Alteburg and thus preclude them from being considered in a sailmaking context (Mitschke 2004, 1008).

Textile Finds from Settlements and Military Camps

Most textiles from Roman settlements originate from a military context. The vast majority of the finds are from Mainz, where they were found in the rubbish from the military camp on the river Rhine (Böhme-Schönberger 2009, 7). However, it is unclear if they originated from the camp or the nearby civilian *vici*. A comparison between the finds from civilian contexts in Cologne and Mainz showed very few differences in the quality of textiles from these two sites. Only the proportion of half-basket weave is higher at Cologne, while the relative share of 2/1 twill is higher at Mainz. Therefore, the textiles from settlements and military camps are presented together.

There are approximately 200 fragments recorded from settlements thus far (Figs 6.12–6.13). About half of them are tabbies, many of them unbalanced (6–13/16–26 threads/cm). A second large group comprises 2/2 twill weaves. In many cases they are also unbalanced like the tabbies, with 8–10/20–26 threads/cm (*cf.* Wild and Bender Jørgensen 1988, 81). About half of them could be identified as diamond twills. The 2/1 twills from Mainz are generally well balanced (7–13/9–13 threads/cm) with very few exceptions (*cf.* Mainz Schillerplatz; Streiter 1988). Half-basket weaves vary in thread count (6–15/10–34 threads/cm) and basket weaves are rare. Other fragments of tabby and half-basket weave are known from Saalburg, Hessen, Mainz and Xanten, Nordrhein-Westfalen (Wild 1970b, 108–109). One extended 2/3 tabby is known from a well at Saalburg castle, Hessen (Wild 1973). A textile made by split-ply twining (*Zwirnspalten*) has also been identified (Böhme-Schönberger and Mitschke 2005; Böhme-Schönberger 2009, 12), but it is still under investigation. Tapestry weaves are rather simple in comparison with the Mediterranean examples (Wild 1982, 15). Generally, the side borders are simple or tubular selvages. Borders are sometimes reinforced by warp bundles, and plied yarns at the edges are common (Böhme-Schönberger 2009, 12). Tablet weaves are rare (Wild 1970b; 1982, 16).

Two interesting instances of textile use in a military context can be noted. The lining of a helmet from Haltern, Nordrhein-Westfalen is a half-basket weave (Bender Jørgensen 1992, 231). A 1st-century AD cavalry helmet from the



Fig. 6.12. Textile fragment from Mainz, Rheinland-Pfalz, Große Langgasse/Emmeranstraße, before 5 BC (© rem, Mannheim).



Fig. 6.13. Textile fragment from Mainz, Rheinland-Pfalz, Große Langgasse/Emmeranstraße, before 5 BC (© rem, Mannheim).

River Rhine near Xanten, Nordrhein-Westfalen had a special textile covering reaching from the forehead to neck and ears (Fig. 6.14; Mitschke 2010). The textile covered the entire helmet on the outside. It was made primarily from horse-tail hair, which was braided and fixed side by side onto the metal surface. Meander bands

Fig. 6.14. Reconstruction of the helmet from Xanten/D, Nordrhein-Westfalen, 1st century AD (© Frank Willer, Rheinisches Landesmuseum Bonn).



decorated the calotte. At the forehead a silver appliqué covered the lower rim. The textiles were glued with a thermoplastic mixture of bitumen, pitch from coniferous trees and animal fat (Willer *et al.* 2008).

Finally, some tabby and twill impressions on tiles are known from Saalburg castle and from Neuss in Nordrhein-Westfalen (Wild 1970a; Banck-Burgess and Pause 2008). Another impression from the Roman fort at Walldürn (Baden-Württemberg) is a diamond twill.

Textiles from Booty or Sacrifice Deposits

The find from Neupotz (Rheinland-Pfalz), which included 700 kg of silver in 1062 pieces, came to light during the exploitation of gravel

in an old water course of the Rhine. Although Ernst Künzl (1993) interpreted it as Alamannic booty, which was lost during a river crossing at the end of the 3rd century AD, other finds were recovered in other parts of that area, suggesting rather the sacrifice of loot (Stadler 2006). Textiles are preserved on some of the finds from Neupotz. They are of medium quality and probably served as wrapping for iron objects. Thus, a tabby (z/z, 4/10 threads/cm) covered the sole or underside of a carpenter's plane. The wrapping of two adze blades had a similar thread count (10/10 threads/cm) but different weave (half-basket and plain twill; Mitschke 2006). Other textiles found in deposits are wrappings for coins in Dillingen-Pachten,



Saarland (Franke 1969), and Alzey, Rheinland-Pfalz (Wild 1970b, 110).

Textiles from Inhumation Graves

Inhumation graves with preserved textiles are Late Antique in date and generally very rich. Grave 1382 from Krefeld-Gellep, Nordrhein-Westfalen, contained a tabby, while grave 1351 had two different linen tabbies (12/12 threads/cm and 10/36 threads/cm) with s-twisted yarns in both systems. Finds from Mainz-Neutor, which included burials of a sarcophagus with sprang bonnet and textile fragments from a female grave, are now lost (Wild 1970b, 120). A decapitated man buried in Late Antiquity under a memorial building at Xanten was wearing a wool tunic with *clavi* (Ullemeyer 1969; Wild 1970c). The sprang from Rommerskirchen, Nordrhein-Westfalen, found at the back of the head of the deceased was combined with a frontlet and gold decoration (Schrade and Stauffer 2007).

Important recent investigations on Late Antique sarcophagus burials from St. Maximin in Trier, Rheinland-Pfalz, are bringing new and interesting information to light (Reifarth 2007; 2011). Twenty-three sarcophagus burials from St. Maximin contained textile remains, including those mentioned by Cüppers (1984, 234 and Kat.-No. 97c, 119 and 120c). Grave no. 279 contained a man who wore a long purple undergarment with long sleeves and a long red tunic made of silk damask (*Blöckchendamast*) and was covered with a gauzy textile (Fig. 6.15; Reifarth 2006 and pers. comm. 2010). The sarcophagus in Grave 35 from St. Maximin, dated to the 4th century AD, probably contained a man from whose undergarment

some fragments of wool tapestry have survived (Dreyspring 2002). The bright tunic was made from silk with *clavi*, roundels and broad stripes at the seams and the neckline. These tapestries were of dark purple wool with bright decorations. The body was wrapped in a fabric of silk damask. Some twisted yarns and some ribbon fragments may have kept the wrapping in place. On the right side of the face, some gold threads were found, probably originally part of a small ribbon (Fig. 6.16). The grave contained several layers of tabby fragments made of bast fibres and wood shavings.

During the opening of the grave of Saint Paulinus at St. Paulin in Trier († AD 358), three different silk fabrics came to light. A 3/1 compound tabby in a reddish colour was laid on the wooden coffin inside the sarcophagus. The fabric inside the coffin was an undyed block damask with z-twisted warp yarn and an unspun weft. Fragments of dark ribbons woven in block damask and dyed with true purple were probably decorations of the fabric lining the coffin (Dreyspring and Schrenk 2007). Some gold threads were also found.

Textiles from Cremation Graves

In contrast, only very few Roman cremation graves contained textiles. They vary in date and the material is less homogeneous than textiles found in inhumation burials. The grave from Mehrum, Nordrhein-Westfalen, yielded two tabby weaves from z-twisted yarns with 16/23 and 13/17 threads/cm respectively (Gechter and Kunow 1983; Bender Jørgensen 1992, 232–233). The cremated bones from grave 6007 at Krefeld-Gellep, Nordrhein-Westfalen, were wrapped in z/z-twisted 2/2 twill (10/12

Fig. 6.15. Burial 279, St. Maximin in Trier, Rheinland-Pfalz (Photo: Courtesy of N. Reifarth).

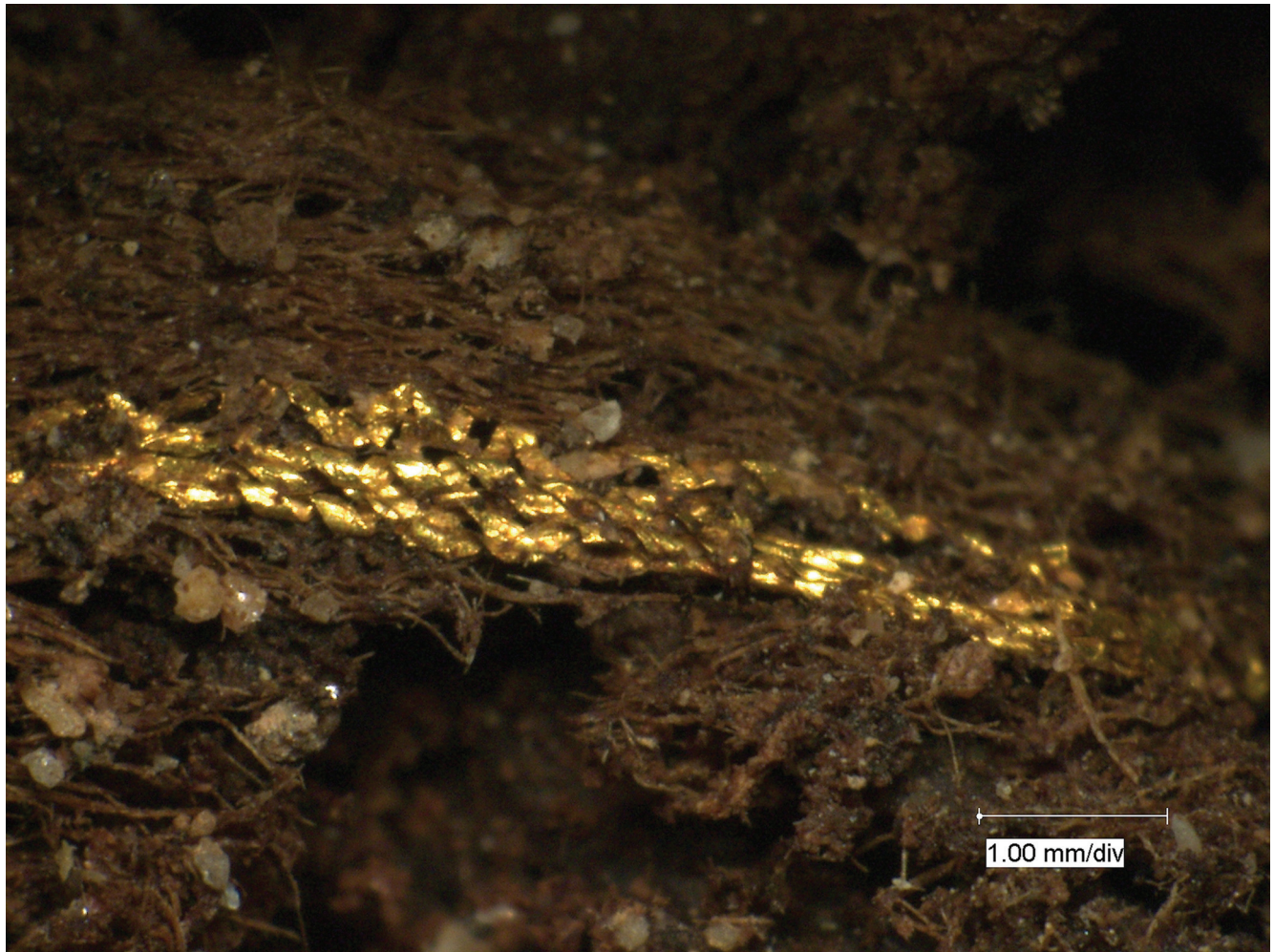


Fig. 6.16. Detail of gold thread, Burial 25, St. Maximin in Trier, Rheinland-Pfalz (Photo: Courtesy of N. Reifarth).

threads/cm) and laid in an urn (Müllauer 2006). In contrast to these 1st-century AD graves, the coin-dated burial from St. Severin in Cologne is a very late cremation grave that contained a purse (?) made of a 2/2 twill weave (z/z, 12/12 threads/cm) and two tabbies mineralised on the blades of a knife and a pair of shears. One is probably made of linen with 30/30 threads/cm and the other is of wool with 15/15 threads/cm (Wild 1970b, table B 3, 40, 50). Of great interest is grave 3 from Wehringen, Bayern, dated to the 2nd century AD. The cremated bones were buried in a mound with a connected stone building (*memoria*). The ashes were found in a glass vessel closed with a lead cover (Nuber and Radnoti 1969; Nuber 2000), which also contained a Chinese silk tabby made from unspun yarn (Bender Jørgensen 1992, 180 note 24).

Conclusions

Although a thorough comparison between the finds from *Germania libera* and the Roman provinces of Germany is a task for the future, a few remarks may prove useful. More than 20 years ago, Wild and Bender Jørgensen (1988) attempted to determine the either Germanic or Roman origin of the cloaks found in northern Germany, but did not reach a consensus. The main obstacle for any comparison is the different nature of sources. In *Germania libera*, much of the material comes from graves which are neither poor nor particularly rich. Most of the information, however, is derived from bogs which provided more or less complete costumes. Important comparative data come from the village of Feddersen Wierde. Within the boundaries of the Roman Empire, textiles from settlements – particularly from Cologne and Mainz – play an important role. However, in contrast to Feddersen Wierde, both are

urban sites, with a partly military background. Otherwise, many textiles were found in extremely rich graves.

The distribution of wool and linen as the most common materials depends on the preservation conditions and does not indicate much about their relative importance during the Roman Iron Age. For instance, Wilhelm Geilmann and Waltraud Gebauhr (1959, 264–269) demonstrated that because of the chemicals contained in ashes, wool will deteriorate rapidly within an urn while this environment does not harm linen to the same extent. On the other hand, in bogs and settlements, hardly any linen survives. Precious materials like silk and gold threads are restricted to high-status graves and are therefore more often found within the Roman Empire where the use of sarcophagi *etc.* enhanced their preservation. Other rare materials are hemp and esparto used for ropes, cotton and possibly goat and camel hair, all found on Roman territory.

The use of spindle whorls is attested for the entire area as is the warp-weighted loom. Other looms may have also been in use as some textiles indicate (Obenaltendorf, Thorsberg). Some buildings, tools and organic remains suggest the production of linen textiles throughout Germany.

In both regions, linen textiles are typically tabbies in z/z twist, with varying thread counts. Few are twills and/or spin-patterned twills. In *Germania libera*, they are primarily preserved as wrappings for ashes and urns or for the wrapping of metal objects deposited inside the urns. In the Roman provinces, they derive mostly from inhumation graves. Linen bags or the wrapping of coins seem to be known in both areas.

The majority of wool fabrics are also woven with z-twisted threads in both systems, but the use of z/s and sometimes s/s-twist is more common than in textiles of plant fibre. Spin patterning and plied yarns also deserve mention. The commonest weave type in the Roman provinces is tabby, followed by 2/2 twill, either plain or diamond. Many of them – tabbies as well as 2/2 twills – are unbalanced in their thread count. The same applies to half-basket weaves while 2/1 twills are usually more balanced, albeit rather coarse. Basket weaves and other extended tabbies as well as damasks are rare. Fine to very fine qualities are

mostly restricted to materials other than sheep wool. Selvedges are plain, tubular or reinforced. Otherwise, twined threads are common in edges, while tablet-woven borders are rare.

In *Germania libera*, a great quantity of wool tabbies was unearthed at Feddersen Wierde, but elsewhere, they are rare. In bogs and inhumation graves, 2/2 twills prevail, including broken and lozenge or diamond variations. The qualities are variable, often low quality in connection with bog bodies, high quality in the weapon deposit of Thorsberg and the entire range present at Feddersen Wierde. As a rule, they are rather balanced. Rare weaves are 2/1 twill, rep as a variation of tabby and extended tabbies. Particularly half-basket weave may be seen as a “typically Gallo-Roman” feature (Wild and Bender Jørgensen 1988, 75–76). It was found together with the bog bodies of Marx-Etzel, Marx-Stapelstein and Obenaltendorf – the latter wearing several garments of probably Roman origin – as well as in Strückhausen and at Feddersen Wierde, although only as decorations in the latter case. The half-basket weaves from Obenaltendorf, Marx-Stapelstein and Marx-Etzel share another feature of Roman origin (Wild and Bender Jørgensen 1988, 76; Wild 2002), *i.e.* selvedges with two groups of warp ends. They have not been found among the more than 80 woven edges from Feddersen Wierde. Twined starting borders as another indication of Roman provenance, are also absent in this material (Ullemeyer and Tidow 1981, 97–108). Narrow tablet-woven borders are common in the bog finds. Otherwise, they occur sporadically in both spheres, Roman and Germanic. Broad, elaborate tablet weaves, however, are restricted to *Germania libera* (Wild and Bender Jørgensen 1988, 82; Ræder Knudsen 2011). Finally, the cruciform shape of the Reepsholt tunic reflects a Roman tradition; Wild considered this piece a “Gallic coat” (1968, 169).²⁵

Basic elements like the use of wool and flax, the spinning direction in z/z, the use of the warp-weighted loom, the manufacture of tabbies and 2/2 twills and even tubular selvedges are common in both spheres and therefore unsuitable for distinguishing between Roman and Germanic textile production. Strontium isotope analyses may be helpful in the future (*cf.* von Carnap-Bornheim *et al.* 2007). At present, the provenance of finds is indicated by a rather short list of characteristic features. Half-basket

weave, possibly unbalanced fabrics and 2/1 twill, certain types of edges and decorations like *clavi* indicate a Roman origin. The same probably holds true for the most precious materials, *i.e.* gold and silk. Elaborate tablet weaves are a seemingly Germanic feature but this needs further study.

Notes

- 1 Some formal details like the use of the German names for the federal states (*Bundesländer*) are continued from chapter 4.
- 2 If not otherwise stated, this section is based on Fischer 1990; *Die Germanen* 1998; Todd 2000; Wamser 2000; Demandt and Engemann 2007; Wells 2007.
- 3 The careers of some German textile archaeologists were strongly connected to the takeover of the Nazi Party (NSDAP) in 1933, particularly Hans Hahne (Ziehe 1996), Walter von Stokar (Schäfer 2003, 9–12) and Karl Schlabow (Lemagnen 2004, 55). To analyse the influence of this background on their textile research is still a *desideratum*. At least as far as Karl Schlabow is concerned, the wish to promote an ideal picture of Germanic people is perceptible in his descriptions and interpretations including his drawings, and even in his major work which was published as late as 1976.
- 4 Many finds from Mainz recovered in the 19th century are scattered in different collections and many were destroyed in the Second World War; see Böhme-Schönberger 2009, 1–13.
- 5 Brilon belongs to the region south-east of Cologne where lead mines are known and which was economically closely related to its Roman neighbours (Bemmann 2007, 98–99, 105). Similar lead loom weights have been found west of the Rhine.
- 6 Throughout 150 years of textile research, the terminology has changed to some extent. Two sources of misinterpretations may be mentioned here. *Ripsbindung* is an expression used for extended tabby or half-basket weave. It does not mean that one of the thread systems covers the other more or less. Previously, the spinning direction was described as *rechts* ('right') or *links* ('left'). However, these terms were not always applied in the same way. While *e.g.* Hans Hahne (1919) used the term *links* for z-twisted yarns, Walter von Stokar used it for s-oriented threads. Therefore, it is often necessary to compare the descriptions with photographs, sketches or modern investigations.
- 7 Woven in s/z according to Schlabow.
- 8 Westersode, listed separately by Bender Jørgensen (1992) belongs, according to Waller (1959), to Hemmoor.
- 9 Woven in s/s according to Schlabow.
- 10 In addition to two finds described by Bender Jørgensen, Stange illustrates a third tabby.
- 11 Based on new archaeological dating by Julian Subbert, one of the present authors, four graves from Mahndorf are pertinent here (SN 23, SN 28b, SN 32, SN 36).
- 12 Apart from a twill, the grave contained a gauze-like tabby in z/z-twist with 10/10 threads/cm. The textiles were recently analysed by Julian Subbert and the burial published by Willi Wegewitz (1988, 144–146).
- 13 Many graves on these sites are later than the Roman Iron Age and are disregarded here, when the date is provided. Additional material from Heiligenhafen in Schleswig-Holstein, as well as from Issendorf, Immenbeck and Cuxhaven in Niedersachsen is currently under investigation by Julian Subbert for his doctoral thesis.
- 14 It is reported as possible silk with twined threads, 30/20 threads/cm.
- 15 von Stokar described it as made of flax and wool.
- 16 Walter von Stokar (1938) mentions flax or additions of hare, cattle or goat hair in context with various fabrics. These identifications require a re-investigation.
- 17 A photograph published by Schlabow seems to verify his determination. A broken twill (*Spitzköper*) in z/z-twist is reported by von Stokar (1938, 123). No further details are given by Johanna Mestorf (1900, 11).
- 18 Woven in z/z-twist according to von Stokar (1938, 123).
- 19 Again, according to von Stokar (1938, 123), z/z-twisted.
- 20 The well-dated finds of Bentstreek and Neu Versen are not included here because the data about the textiles are too sparse.
- 21 The twill is irregularly broken according to Hahne, plain according to Schlabow.
- 22 Schlabow (1976) relies on Hahne but unfortunately misinterprets him. Therefore, Schlabow's descriptions are omitted here.
- 23 The following description is based on Fuhrmann 1941–42.
- 24 The interpretation is solely based on its shape. In the vicinity of the find locations there are lead mines, so other possibilities have to be considered.
- 25 A comparison of numerous tunics is given in Möller-Wiering (2011).

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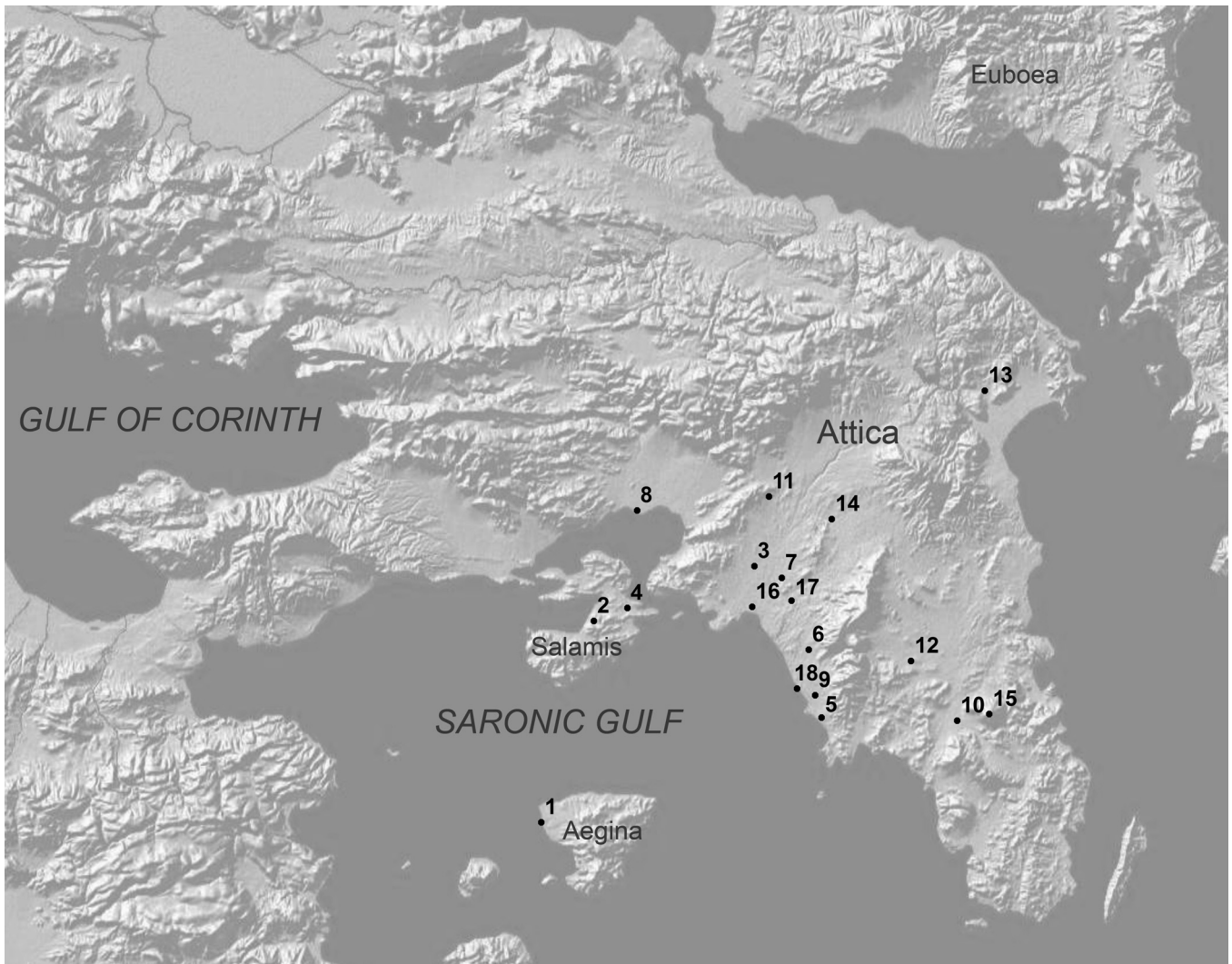
GREECE

Early Bronze Age	3500–2000 BC
Middle Bronze Age	2000–1600 BC
Late Bronze Age	1600–1050 BC
Geometric period	1050–700 BC
Archaic period	700–490 BC
Classical period	490–338 BC
Hellenistic period	338–30 BC
Roman period	30 BC–AD 330

GREECE



Map 7.1. Greece. Sites mentioned in Chapter 7.



Map 7.2. Greece, Attica. Sites mentioned in Chapter 7:

- | | |
|----------------|----------------|
| 1 Aegina | 10 Kalyvia |
| 2 Agia Kyriaki | 11 Kamatero |
| 3 Aigaleo | 12 Koropi |
| 4 Ampelakia | 13 Marathon |
| 5 Ano Voula | 14 Maroussi |
| 6 Argyroupolis | 15 Merenda |
| 7 Athens | 16 Moschato |
| 8 Eleusis | 17 Neos Kosmos |
| 9 Glyfada | 18 Trachones |

Greece

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Introduction

The study of Greek archaeological textiles is still in its infancy. The majority of textiles discovered in Greece have been preserved in a mineralised state and the application of a new investigative methodology, particularly adapted to this category of remains, has allowed the investigation of textiles from the old finds as well as those from recent excavations. In this chapter, the current state of research on the most significant Greek archaeological textiles is presented. Apart from the remains discovered in the ancient town of Akrotiri, the vast majority of the textiles derive from funerary contexts. Iconographic and written sources, as well as textile tools are not considered here.

Chronological and Cultural Background

The earliest archaeological textiles of Greece date to the Bronze Age when two great civilisations flourished. The Minoan culture of Bronze Age Crete is named after the legendary king of Crete, Minos. Arthur Evans, the excavator of Knossos, the main site on Crete, developed a relative Minoan chronology based on pottery styles, dividing the Cretan

Bronze Age into three main periods: Early Minoan (EM), Middle Minoan (MM) and Late Minoan (LM). Each of these periods is further subdivided into shorter phases (Dickinson 1994; Shelmerdine 2008). An alternative dating system is based on the construction and destruction of the Minoan palaces. Absolute dates have traditionally been calculated on the basis of synchronisms with Egypt and Mesopotamia:

Prepalatial	(EM I–MM IA)
	<i>c.</i> 3100–1900 BC
Protopalatial	(MM IB–II)
	<i>c.</i> 1900–1700 BC
Neopalatial	(MM III–LM IB)
	<i>c.</i> 1700–1425 BC
Final Palatial	(LM II–LM IIIA1)
	<i>c.</i> 1425–1370 BC
Postpalatial	(LM IIIA2–IIIC)
	<i>c.</i> 1370–1050 BC

A distinctive feature of the Minoan civilisation is the large architectural complex, traditionally known as a ‘palace’ and considered to be the residence of a ruling elite. It functioned as an administrative, ceremonial, manufacturing and storage centre, indicating the existence of a centralised authority (Fitton 2002). The site of Knossos is traditionally considered to have been the pre-eminent Minoan centre. Archaeological

evidence in and outside Crete indicates that the Minoans developed extensive overseas contacts with the eastern Mediterranean region. By the Neopalatial period, aspects of Minoan material culture had been widely adopted across the southern Aegean area (Shelmerdine 2008). The spectacular frescoes from Akrotiri on the island of Thera, preserved as a result of a volcanic eruption, demonstrate the sophistication of Minoan culture (Doumas 1992). The settlement was destroyed in LMIA, although there is a debate regarding the absolute date of the volcanic eruption (1520 or 1620 BC).

On mainland Greece, the Early Bronze Age is known as the Early Helladic period (c. 3100–2000 BC). It is characterised by the introduction of monumental architecture and new pottery styles, the increasing use of metals, the development of foreign trade contacts and a general increase in wealth. The following Middle Bronze Age, or Middle Helladic, period (c. 2000–1600 BC) is distinguished by the appearance of the so-called Minyan and Matt Painted ceramics, new architectural features and an apparent decline in the degree of social complexity (Dickinson 1994; Shelmerdine 2008).

The Late Helladic period (c. 1600–1050 BC) is associated with the second great Bronze Age civilisation of Greece, which takes its name from the archaeological site of Mycenae in the north-eastern Argolid in southern Greece (Schofield 2007). The acme of this culture coincided with the eclipse of the Minoan civilisation. During this period a strong Mycenaean influence is evident across the Aegean region. A number of independent Mycenaean states were established on the mainland. The administration of each state was highly centralised and was run from a palatial centre, which was usually fortified. Much of the information about the Mycenaean economy is based on written evidence, which survives in the form of tablet archives written in the Linear B script. These archives consist of detailed administrative records indicating the existence of a complex bureaucracy, and they provide important information about the organisation of textile production (Chadwick 1976; Killen 2007; Shelmerdine 2008). Mycenaean society was based on a warrior aristocracy, and the elite were buried in *tholos* tombs, large circular burial chambers

with a high vaulted roof and straight stone-lined entry passage, accompanied by weapons and other burial goods. The Mycenaean political and economic systems collapsed at the end of the LH IIIB period (c. 1200 BC), when the palaces were destroyed and a number of settlements were abandoned. With the fall of the palaces, large-scale architecture, representational art and bureaucracy, including the writing system, disappeared (Schofield 2007; Shelmerdine 2008). The following century and a half saw the total collapse of Mycenaean civilisation and was marked by a significant mobility among the Aegean populations (Dickinson 2006). This period (1200–700 BC) used to be known as the Dark Age, but now the preferred designation is the Early Iron Age.

During the 11th century BC, cremation was gradually adopted on the Greek mainland and iron work was introduced, heralding the onset of the Iron Age (Biers 1996). In the period between 900 and 700 BC, long-distance communications improved and the standard of living rose (Coldstream 2003). The inhumation burial rite was reintroduced and practised side by side with cremation. This period is known as the Geometric period because during this time the Geometric art style developed and flourished (Biers 1996; Pedley 2007). The structure of society changed from the one dominated by kings to one where power was held by aristocratic clans, with the resulting establishment of the *polis*, also known as the city-state, which became the basic unit of politics (Pomeroy *et al.* 1999). Athens gained control of its surrounding territories faster than other cities, so that from the beginning of the historical period, the story of Athens is also the story of Attica, the region surrounding the city. The 8th century BC saw the beginning of the establishment of trading colonies on the western coast of Turkey, and Greek colonisation in southern Italy and Sicily (Boardman 1999). The intensified long-distance contacts were accompanied by the introduction of alphabetic writing, the rebirth of representational art and monumental architecture, the rise of sanctuaries and the establishment of the first Olympic Games in 776 BC, which marks the traditional beginning of the Ancient Greek period, although most historians now extend the term back to about 1000 BC.

The 7th century BC saw the further development of trends that emerged in the

8th century BC. In particular, contacts with the Near East became particularly visible in the imported goods and the style of art, thus giving the name the Orientalising period to this time. The colonising movement continued, now also into the Black Sea area. During the Archaic period (600–490 BC), the most important political and social institutions of ancient Greek culture stabilised, centring around the *polis*. The following Classical period (480–323 BC) is generally regarded as the apogee of Greek cultural achievements, with a flourishing literature and art (Pollitt 1972; Biers 1996; Pedley 2007).

The Hellenistic period of Greek history begins with the death of Alexander the Great in 323 BC and ends with the beginning of the rule of Augustus in 30 BC, although the Greek peninsula and islands were annexed by Rome already in 146 BC (Biers 1996). The Romans divided the land into four smaller regions, and Macedonia officially became a province, with its capital at Thessalonica. The rest of the Greek city-states gradually and eventually paid homage to Rome ending their *de jure* autonomy as well. The Romans left the local administration to the Greeks without making any attempt to abolish traditional political patterns.

Research History

The investigation of the archaeological textiles of Greece goes back to the 1950s, a period when many textiles were being discovered and studied. Apart from isolated cases, however, scientific research did not truly begin until 2000, when a new stage of investigation was initiated by the Centre Hellénique de Recherche et de Restauration des Tissus Archéologiques (ARTEX) in Athens.

Bronze Age

Akrotiri

The excavations of the site of Akrotiri on the island of Thera revealed an ancient town preserved under the ashes accumulated during the volcanic eruption dated to the middle of the 17th century BC (Marinatos 1999). Among the finds were organic remains of great diversity, and the study of textiles, which began in 2004 (Moulherat and Spantidaki 2007b), enabled the investigation of textile production in the Aegean world during the Bronze Age.

In 1999, during the excavation of pillar pit no. 52 of the canopy for the site, a heap of caprine horns and a golden figurine of a goat were discovered, connected to a ceremonial context. In this deposit, 25 carbonised fragments of organic material, measuring 0.5–3 cm, with an average of 1.5 cm were recovered. Investigations demonstrated that they all belonged to the same textile. Their preservation is due to the heat resulting from the volcanic eruption, which, in anaerobic conditions, caused the carbonisation of the textile. It is woven in tabby binding common to the Aegean area in the Bronze Age. It is balanced, with 20–22 S-ply threads/cm in both directions. The thread diameter is about 0.25–0.4 mm, with a mean of 0.3 mm. Even if the process of carbonisation is likely to have reduced the dimensions of the threads slightly, the textile is still exceptionally fine. The identification of the fibre demonstrated that the raw material used was flax. The majority of the fragments have folds and superpositions which, without doubt, contributed to their preservation, while the fragments of a single layer were more likely to disappear.

Careful observation of these remains demonstrated the presence of a series of decorative techniques: a decorative hem, traces of embroidery and various kinds of fringes. Thus, on one of the six fragments, at the place where it was folded, it was possible to identify a hem with decorative sewing made with a thicker thread. On the surface of another fragment, a thread with a slightly larger diameter (0.55 mm) was found, passing across the textile to reappear further away. At the end of its trajectory, it creates a knot, from which start some finer threads, also decorated with small knots and creating a fringe. It appears to be a type of embroidery, the pattern of which is not discernible due to the small dimensions of the fragment. It is interesting to note that the fringe is made with external threads and not those from the textile itself.

The third decorative technique consists of fringes made by the loose threads from the textile. Even though the dimensions of the fragments are quite small, this type of decoration is frequently found. In the cases where more fringes survive, they are decorated with knots of various sizes. Very often, a group of fringes is brought together and bound by a thread, thus creating a kind of tassel.

Fig. 7.1. (left) General view of the textile from pylon shaft 68a of the Akrotiri canopy (Photo: Y. Spantidaki and C. Moulherat).



Fig. 7.2. (right) One of the fragments of the sack discovered in pylon shaft 1b (Photo: Y. Spantidaki and C. Moulherat).



This is the first time that excavated organic material attests the existence of textiles which were decorated in various ways. These minute fragments are of great importance not only because they exemplify fine multi-decorated textiles known from the Bronze Age Aegean frescoes, but also because they answer questions regarding the realism of the costume representations depicted. These minute remains demonstrate the fringes which finish the skirts, the sewing which must have existed to adjust the costume on the body, and all the decorative details which until now were only known from the Akrotiri frescoes.

In 2000, another textile fragment measuring 8×13 cm was found in pillar pit 68a, which exemplifies the coexistence of the different states of conservation in the same textile (Fig. 7.1). It consists of two layers with threads running in the same direction; at the bottom of the textile, the place where it was folded can be distinguished. On the surface, thread morphology varies depending on the area observed; they appear more or less desiccated. On one side of the cloth, in a place where the top layer is now destroyed, the lower layer can be observed in its original state. The textile is a weft-dominant tabby with 4–5 threads/cm in the warp and 10–12 threads/cm in the weft. A special effect created in this way is further accentuated by the fact that threads of different construction and diameter were used in each system. The warp threads are S-plied with a diameter of approximately 0.7 mm, while the weft threads are single z-twisted, with a diameter of 1.2 mm. The fibre identification demonstrated that the yarn in both systems of the textile is of plant origin. Whilst the warp threads are linen, the weft threads are of another, as yet unidentified fibre. On the

top part of this textile, remains of an edge can be distinguished. It is made up of two pairs of threads, which are thicker than those constituting the textile, with the diameter of each thread surpassing 1 mm. It is probably a fragment of a simple utilitarian textile as indicated by the thread diameter and low thread count. Despite this however, the choice of different materials indicates the care with which this society produced even simple objects.

In 2000, in pillar pit 1b, remains of a textile associated with carbonised grains of barley were discovered, the latter suggesting that it was a sack. Investigation of the surface of this assemblage demonstrated three small areas where the textile was more visible. One area corresponded to a textile, while the other two presented remains of a net. The textile is a tabby but with a particular characteristic: the warp consists of 5–6 S-plied threads/cm with a diameter of 0.3–0.4 mm, while the weft thread count is 7 threads/cm, with thread characterised by diameters ranging from 0.6 to 1–2 mm and a strip-like appearance with no apparent twist. These strips do not always have the same width, thus creating the appearance of a wider horizontal band in some places; this alternation is used in order to create a decorative effect (Fig. 7.2). The method employed to create this textile is a combination of weaving as well as mat-making techniques, since the material utilised is specific to both techniques: plant fibre obtained by spinning, used for the warp, and plant fibre strips, which can be used without further treatment for the weft. This textile reveals that a large variety of techniques were used at Akrotiri, and raises questions regarding the type of loom used for its construction. The presence of the net suggests that the sack of grain may have been suspended to remove it

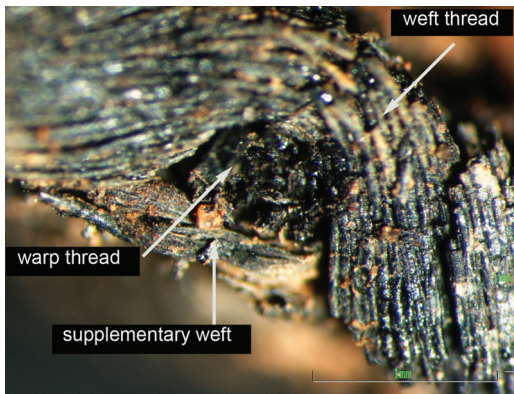


Fig. 7.3. Detail of the band discovered in Chania, showing the use of linen warp, weft in goat hair and supplementary thread in nettle (Photo: Y. Spantidaki and C. Moulherat).



Fig. 7.4. Detail of the balanced tabby preserved on bronze dagger No. 8591 from Tomb N of Circle B at Mycenae (Photo: Y. Spantidaki and C. Moulherat).

from direct sunlight and to prevent damage by vermin.

The study of these textiles demonstrates the importance of plant fibre in their making. We have identified flax and other plant species, which are currently undergoing analysis. The recent discovery of about 50 fragments of wool thread from pillar pit 65N also attests the use of animal fibre (Moulherat and Spantidaki 2008). All these discoveries demonstrate the experience of the inhabitants of Akrotiri in the exploitation of their environment.

Chania

The simultaneous use of animal and plant fibres is demonstrated by the remains of a carbonised band of the Minoan period, discovered during Greco-Swedish excavations on Saint Catherine's Square, on the Castelli hill at Chania and currently preserved in the Archaeological Museum of Chania (inv. no. GSE 84 Misc17). The band measures 6 mm in width and is exceptional for its fineness and for the use of nettle fibre and goat hair, the latter documented for the first time in the Aegean world (Moulherat and Spantidaki 2009a). The band consists of linen warp, weft of animal hair, and supplementary threads of nettle fibre (Fig. 7.3). Bast fibres, which are found in nettle and flax, are difficult to dye. Therefore, it is supposed that the decoration of the band was obtained by using the natural colour of the fibre. Thus, the decorative effect was probably achieved by a combination of the strongly pigmented hair of the weft and the natural whiteness of the nettle decorative thread.



Fig. 7.5. Detail of the balanced tabby preserved on bronze dagger No. 8592 from Tomb N of Circle B at Mycenae (Photo: Y. Spantidaki and C. Moulherat).

Object	Weave	Thread twist		Thread diameter (mm)		Thread count/cm	
		System 1	System 2	System 1	System 2	System 1	System 2
Pitcher 16496	balanced tabby	s	s	0.3-0.6	0.4-0.9	14	16-18
Jar 16494	balanced tabby	s	s	0.3-0.5	0.3-0.7	16-18	16-18
Jar 16495	balanced tabby	s	s	0.3-0.5	0.3-0.5	16-18	16-18

Table 7.1. Summary of the main qualitative and quantitative characteristics of textiles from Pylona (After de Wild 2001).

Tomb	Date	Object	Weave	Structure	Twist	Thread count/cm	Fibre
S.38.12	Sub-Mycenaen	iron pin	weft-faced tabby	single	z low	25/9; 22/10; 18/6	wool?
S.38.11	Sub-Mycenaen	iron pin	weft-faced tabby	simple	z low	10/22	?
S.38.11	Sub-Mycenaen	iron pin	balanced tabby	simple	z low	22/22	wool?
S.38.13	Sub-Mycenaen	iron fragment	weft-faced tabby	simple	z low	10/19	wool?
S.10.12	Early Proto-Geometric	iron pin	weft-faced tabby	simple	z	?	?
S.10.12	Early Proto-Geometric	iron pin	balanced tabby	simple	s	18/20	?
S.10.12	Early Proto-Geometric	iron pin	balanced tabby	?	?	?	?
S.10.11/13	Early Proto-Geometric	iron pin	balanced tabby	simple	s	18/20	?
S.46.8	Early Proto-Geometric	iron fibula	balanced tabby	simple	s	14/22	?
S.51.5	Middle Proto-Geometric	iron fibula	balanced tabby	simple	s	16/20	?
P.3.27	Late Proto-Geometric	iron pin	weft-faced tabby	simple	z?	10/20	?
P.22.35	Late Proto-Geometric	iron pin	balanced tabby	plied?	S	12/14	?
P.23.16	Late Proto-Geometric	iron pin	balanced tabby	?	?	?	?
P.24.12	Late Proto-Geometric	iron pin	weft-faced tabby	simple	z	25/10	?
P.24.13	Late Proto-Geometric	iron pin	weft-faced tabby	simple	z	25/10	?
T.14.4	Late Proto-Geometric	iron sword	weft-faced tabby	simple	z	12/22	?
P.10.22	Sub Proto-Geometric I	iron pin	balanced tabby	plied?	S	?	?
P.39.6	Sub Proto-Geometric I	iron fibula	balanced tabby	plied	S	10/12	?
P.39.7	Sub Proto-Geometric I	iron fibula	balanced tabby	plied	S	12/14	?
S.33.19	Sub Proto-Geometric II	iron pin	balanced tabby	simple	s	18/18	?
T 13.23/24	Sub Proto-Geometric II	bronze bracelet	balanced tabby	simple	s?	26/40 (-)	linen?
S 59.27	Sub Proto-Geometric III	iron pin	weft-faced tabby	?	?	?	?
T 33.15	Sub Proto-Geometric III	bronze vase	balanced tabby	imprint	?	12/12	?
P11.1	Not dated	iron pin	balanced tabby	?	?	?	?

Table 7.2. Summary of the main qualitative and quantitative characteristics of textiles from the necropolis of Lefkandi (After Sacket and Carrington-Smith 1980).

Tomb	Object	Weave	Twist		Thread diameter (mm)		Thread count/cm		Fibre
			System I	System II	System I	System II	System I	System II	
T.39.35	iron dagger	weft-faced tabby	z medium	z very low	0.20-0.25	0.20-0.30	11	50	wool
T.39.35	iron dagger	weft-faced tabby	?	?	?	0.42-0.45	?	?	?
T.41.13	iron knife blade	weft-faced tabby	z	z very low	0.38	0.20-0.30	14-16	40-50	wool
T.41.14	iron knife blade	weft-faced tabby	?	?	?	?	?	?	wool
T.46.11	pyxis	balanced tabby	?	?	0.23	0.16	10	10	?
T.46.24	iron pin	balanced tabby	z high	z high	0.30-0.40	0.30-0.42	c.14	c. 14	wool
T.50.2	iron sword	weft-faced tabby	z high	z low	0.25-0.30	0.15-0.25	12-14	50-60	wool
T.50.4	knife blade	weft-faced tabby	z	no visible twist	0.20-0.25	0.15-0.20	12-14	60	wool
T.52.5	iron pin	weft-faced tabby	z medium	z medium	0.50	0.25	12	50-55	wool
T.52.5	iron pin	weft-faced tabby	z medium	z low	0.30-0.35	0.15-0.20	16	40	linen
T.57.7	iron fibula	weft-faced tabby	z medium	z very low	0.65-0.70	0.25-0.30	6-7	c. 35-40	wool
T.63.37	iron fibula	weft-dominant tabby	no visible twist	S2z at ends	0.77-0.95	0.92-1.10	5-6	10-12	linen
T.70.27	iron pin	weft-faced tabby	s medium	z low	0.65	0.17-0.22	14	c. 40	wool
T.75.5	iron fibula	balanced tabby	S2z low	S2z	0.60	0.44-0.48	10	12	linen
Tr.M6	bronze knife	weft-faced tabby	z	z very low	0.30	0.15	12	40-45	wool

Table 7.3. Summary of the main qualitative and quantitative characteristics of samples of textiles from the necropolis of Lefkandi.

Object	Weave	Twist		Diameter (mm)		Thread count/cm		Fibre
		System I	System II	System I	System II	System I	System II	
Bronze basin 23173-23174	weft-faced tabby	S2z	z low	0.25	0.18-0.24	16-20	60-90	wool
Bronze basin 23173-23174	weft-faced tabby	?	?	?	0,15	?	100-120	?
Bronze basin 24289	weft-faced tabby	?	?	0.07-0.08	0.04	32	80	linen
Bronze basin 24724-24726	weft-faced tabby	s low	z low	0.3	0.10-0.20	14-16	60-100	wool, purple
Bronze basin 24725	weft-faced tabby	s	no visible twist	?	0.08-0.11	14-16	90-100	wool, purple
Bronze basin 26636	balanced tabby	z high	z low	0.18-0.2	0.14-0.18	40-50	40-50	wool

Table 7.4. Summary of the main qualitative and quantitative characteristics of samples of textiles from Corfu.



Fig. 7.6. Detail of the balanced tabby preserved on bronze spearhead No. 8589 from Tomb N of Circle B at Mycenae (Photo: Y. Spantidaki and C. Moulherat).



Fig. 7.7. Detail of the decorated fragment on a dagger T.39.35 from Lefkandi (Photo: Y. Spantidaki and C. Moulherat).

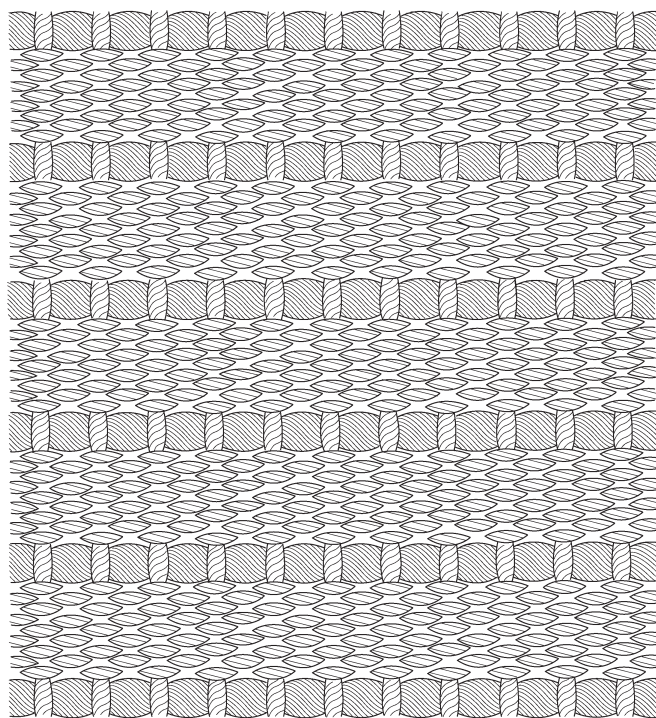


Fig. 7.8. Graphic reconstruction of the decoration on the textile from the dagger found at Lefkandi with the introduction of a supplementary weft thread of greater diameter every 10 threads (Reconstruction by R. Doscan).

Mycenae

In its Mycenaean collections, the National Museum of Athens possesses two daggers (inv. nos. 8591 and 8592; Figs 7.4–7.5), and a spearhead in bronze (inv. no. 8589; Fig. 7.6), from Tomb N of Circle B in Mycenae, dated to the 16th century BC (Mylonas 1973). They are of special interest due to the textile remains preserved on their surface (No. 8591, 13 cm, No. 8592, 15 cm and No. 8589, 21.5 cm), which belong to the same textile. The textile is a balanced tabby in linen, woven of plied S2z warp and weft threads. The thread count is 20/22 threads/cm. The mean thread diameter is 0.3 mm.

Pylona

From tomb 1 of the Mycenaean cemetery of Pylona on the island of Rhodes dated to the 14th century BC, three ceramic vessels preserve remains of calcified textiles with analogous characteristics (de Wild 2001), summarised in Table 7.1. Although information regarding thread structure is not provided, it may be surmised that the threads were probably plied; de Wild suggests that the textile is probably linen.

Salamis

One of the tombs in the Mycenaean necropolis

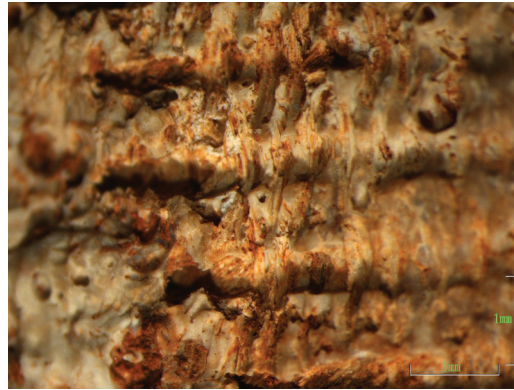


Fig. 7.9. (left) View of the Attic Protogeometric amphora base preserving remains of a heavily mineralised textile (Photo: Y. Spantidaki and C. Moulherat).

Fig. 7.10. (right) Detail of the weft-faced tabby on the Protogeometric amphora (Photo: Y. Spantidaki and C. Moulherat).

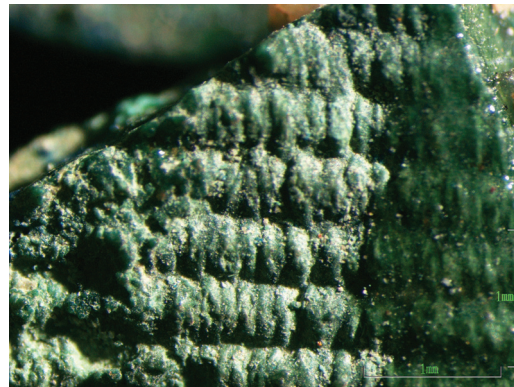


Fig. 7.11. (left) A fragment from one of the Archaic metal urns from Corfu, on which the remains of a weft-faced tabby textile are still visible (Photo: Y. Spantidaki and C. Moulherat).

Fig. 7.12. (right) Detail showing the fineness of the weft threads in one of the Corfu textiles (Photo: Y. Spantidaki and C. Moulherat).

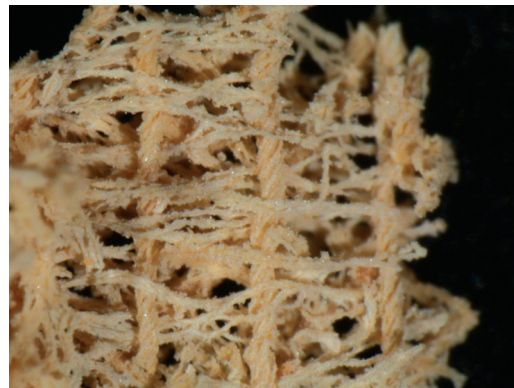


Fig. 7.13. (left) Detail showing the fineness and the high weft thread count of the textile Kamatero. The warp is visible to the right permitting the difference in thread diameters to be seen (Photo: Y. Spantidaki and C. Moulherat).

Fig. 7.14. (right) Detail of a textile from Kalyvia which demonstrates a clear difference between the warp and weft threads (Photo: Y. Spantidaki and C. Moulherat).

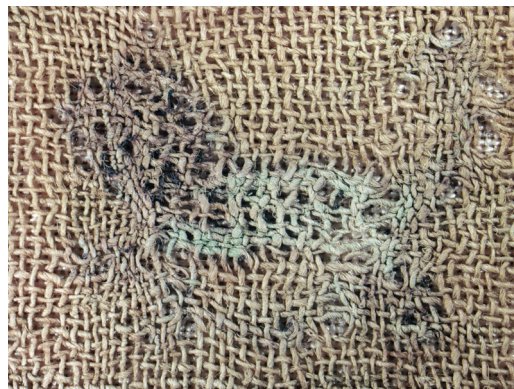
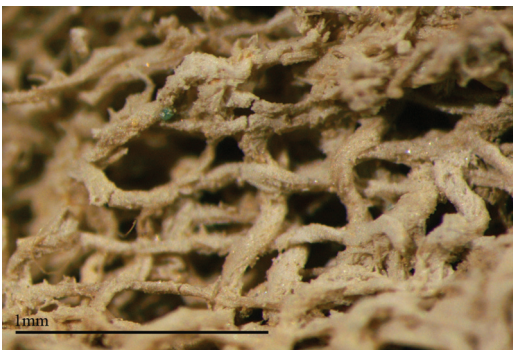


Fig. 7.15. (left) Detail of a very fine textile from Maroussi with multiple layers visible (Photo: Y. Spantidaki and C. Moulherat).

Fig. 7.16. (right) General view of embroidered lions on textile 1 from Koropi (Photo: Y. Spantidaki and C. Moulherat).

of Agia Kyriaki on the island of Salamis, excavated by E. Konsolaki and now conserved in the Archaeological Museum of Piraeus, contained a rich assemblage of burial goods, among which textile remains were preserved (Moulherat and Spantidaki 2009b). The balanced tabby was woven of S2z-plied threads and has a thread count of 14 threads/cm in warp and weft. The analysis has demonstrated that the threads are linen and their mean diameter is 0.4 mm.

Geometric Period

Lefkandi

The necropolis of Lefkandi on Euboea is of particular interest because its burials are dated to the transitional period between the Bronze Age and Iron Age. From the textile point of view, it is possible to observe the changes in the traditions of spinning and weaving, as attested by the exceptional discovery of the so-called shroud in the Heroon of Lefkandi and the two bands that accompanied it. The latter marks the first appearance of chevron twill in the Aegean world.

The necropolis of Lefkandi contains different types of burials (cremation, inhumation, tumulus), some of which yielded textile fragments preserved in a mineralised state on metal objects. The results of the first series of examinations by J. Carrington Smith in 1980 (Sacket and Carrington-Smith 1980) combined with the recent analyses of the second series are presented in Tables 7.2 and 7.3.

The finds from Lefkandi testify to the profound changes in textile making in the beginning of the 1st millennium BC. The most important change is the predominance of single z-twisted threads, as opposed to the S-plied threads, which characterised the majority of the Aegean Bronze Age textiles. The importance of weft-faced tabbies and the exceptionally high weft thread count in their production represent the second great change in textile technology in comparison to the preceding periods. In the textiles of Lefkandi, thread counts reach 60 threads/cm. This type of textile is found in later periods, with even higher thread counts.

Among the textiles investigated, one (T.39.35) merits particular attention for the presence of decoration (Fig. 7.7). The decoration consists of the insertion of

a supplementary weft thread of greater diameter every 10 threads. The use of these supplementary threads produces an effect of horizontal bands across the textile, which is accentuated by the high density of weft threads of smaller diameter (Fig. 7.8).

A systematic fibre identification was conducted in the second series of finds from the necropolis of Lefkandi. It revealed the growing importance of wool, while linen was identified only in three textiles.

Athens

An Attic amphora dated 875–860 BC and conserved in the National Museum of Athens (inv. no. 21267) has mineralised textile remains preserved in superimposing layers (Kourou 2002, 68–69, pl. 78:1). The technical study and the observation of the orientation of the different layers suggest that these remains belonged to a folded textile, which was placed under the base of the vase (Fig. 7.9). The textile is a weft-faced tabby. The warp threads are plied S2z, with a thread count of 8–10 threads/cm and an average thread diameter of 0.40–0.45 mm. The twist of the weft threads is not discernible, while the thread count is 64 threads/cm and the thread diameter is 0.17–0.27 mm (Fig. 7.10). The thread count of the weft is quite exceptional and is comparable to the textiles from the necropolis of Lefkandi.

Eretria

A bronze urn from tomb 10 of the necropolis of Eretria on Euboea, dated to the second half of the 8th century BC, contained three fragments of the same textile, now in the Archaeological Museum of Eretria (Bloesch and Mühletaler 1967). It is a balanced linen tabby with a thread count of 18/22 threads/cm.

Archaic Period

Corfu (Kerkyra)

The textiles from the city of Corfu dated to the end of the 7th century BC and conserved in the Archaeological Museum of Korfu, were used to contain the cremated bones of the deceased placed in metal urns (Table 7.4). The close contact between the textiles and the walls of the urns led to the preservation of the textiles in a mineralised state (Metallinou *et al.* 2009). These textiles are very fine weft-faced tabbies and have several other aspects

in common. The thread count can reach 120 threads/cm and the diameter of some threads is less than 0.1 mm (Figs 7.11–7.12). The use of purple wool in two of the urns testifies to the exceptional character of these textiles. Their great homogeneity suggests that they were made in the same workshop.

Vergina

A bronze urn from the Archaic necropolis of Vergina (6th century BC) contained the remains of a textile, a weft-faced tabby with 11 threads/cm in warp and almost double that amount in weft. The warp threads are single z-twisted with a diameter of 0.43 mm, while the weft threads have no discernible spin, with a diameter of 1 mm (Moraïtou 2001).

Classical Period

Attica

The practice of cremation in Attica during the 5th–4th centuries BC has greatly contributed to the preservation of many textiles. The presence of some textiles inside the funerary urns has been noted on numerous occasions. These textiles are very homogeneous in terms of binding, thread structure and twist, thread diameter, thread count and finally in terms of fibre. The majority of textiles are balanced tabbies in linen woven with single z-twisted warp and weft threads, with a diameter of 0.2–0.3 mm and a thread count of 14/26 threads/cm. The summary is provided in Table 7.5.

Within this corpus, there is another category of textiles that has exceptional characteristics. The textiles from Kamatero (Fig. 7.13), Kalyvia (Fig. 7.14; Moulherat and Spantidaki 2007a) and textile 2 from Maroussi (Fig. 7.15) have a thread count equal to or above 60 threads/cm and are woven with yarn of exceptional fineness. Additionally, the last two textiles are decorated with purple. One of the textiles of Koropi (No 1) has traces of an embroidered decoration which consisted of a series of diamonds, each enclosing a striding lion (Fig. 7.16). The embroidery was done with gilded silver threads, although now only needle holes remain to indicate the pattern (Beckwith 1954).

The textiles from Kerameikos represent another testimony to exceptional textiles. In fact, during the 1930s, a stone sarcophagus containing a bronze urn placed in a wooden

chest (tomb no. HTR₇₃) was discovered in Kerameikos in Athens. It was dated to the end of the 5th century BC. Numerous textile fragments were preserved inside the urn. The study of these remains was conducted by Hans-Jürgen Hundt, who published the results of the analyses of five textiles, which the laboratory of Krefeld in Germany identified as being made of silk (Hundt 1969, 66), although recent re-analysis has demonstrated that all these textiles are of plant fibre (Margariti *et al.* 2010). Some of them were decorated with purple. The thread count of these textiles and the fineness of thread are exceptional (Table 7.6) and recall the quality of the Kalyvia textile. One of the textiles bears traces of embroidered decoration, although less elaborate than that of the Koropi textile. It testifies to the use of this decorative technique in Attica since the 5th century BC.

Hellenistic Period

The practice of textile use in the funerary urns observed in Corfu and in Attica is also attested for the later period among the examples preserved in Macedonia.

Demetrias

The remains of two mineralised textiles were extracted from a bronze urn from tomb 389 of the Demetrias necropolis in Macedonia, dated to the first half of the 4th century BC (Asderaki *et al.* 2004). The first textile is a balanced tabby of linen(?) consisting of z-twisted threads with a thread count of 23/25 threads/cm. The mean diameter of threads in one direction is 0.19 mm, in the other 0.25 mm. The second textile is a weft-faced tabby in wool with a thread count of 20/27 threads/cm. In this second textile, warp threads have a high z twist, while weft threads do not have a discernible twist. The warp thread diameter is 0.19 mm, while the diameter of the weft thread is 0.35 mm.

Vergina

In 1977, the so-called royal Tomb of Philip II at Vergina, dated to the second half of the 4th century BC, revealed the most spectacular textile ever discovered in Greece and probably even in Europe (Fig. 7.17). It was found inside a golden larnax, placed in the antechamber of Tomb 2 of the Great Tumulus, which contained the cremated remains of a woman

Fig. 7.17. (left) Gold and purple textile found in the golden larnax in the so-called Tomb of Philip II, Vergina (After Andronikos 1984).



Fig. 7.18. (top right) Detail of a balanced tabby from Aegina woven in single z-twisted yarn (Photo: Y. Spantidaki and C. Moulherat).



Fig. 7.19. (bottom right) West-faced tabby from Aigaleo woven in single s-twisted yarn (Photo: Y. Spantidaki and C. Moulherat).



(Andronikos 1984; Flury-Lemberg 1988). According to Drougou (1987), it was a purple textile of rectangular shape with two richly decorated ends. The decoration is executed in the tapestry technique. The warp was probably made of purple wool and the weft of purple wool and gold sheet.

Of the other textiles from this tomb, one is currently undergoing examination (Moraitou 2007). It is a balanced tabby from the funerary pyre of Philip II. It is made of single z-twisted threads with a thread count of 25 threads/cm. For fibre identification, “Isolated fibres from the untreated group of fragments were examined at a magnification of x20 and seemed to preserve the characteristic convolution of cotton” (Moraitou 2007, 6).

Attica

Attica, from the 5th century BC until the Roman period, yielded several valuable finds. Apart from the textile remains from inhumation burials, there were textile traces adhering to the metal objects accompanying the dead: personal ornaments, weapons and utensils (Table 7.7). In this context, a large variety of textiles was observed. They illustrate the details of weave, thread twist and fibre (Figs 7.18–7.19).

Roman Period

Under the Roman Empire, a new type of textile appeared, which was characterised by

the addition of decoration with gold thread executed in tapestry technique.

Attica

The two examples presented in Table 7.8 are characterised by an inferior quality in terms of thread count and yarn diameter compared to the textiles dated to the Hellenistic period. The explanation in the case of the textile from the Cave of Euripides is that it is a sack that contained a hoard of coins. The coarse quality of the textiles such as that from Glyfada (Fig. 7.20) may be explained by the deterioration in the quality of textiles produced at the end of the Roman period in Attica, a phenomenon also observed elsewhere.

Thessaloniki

From Thessaloniki (Inv. no. 18218) comes a spectacular tapestry woven in purple silk and gold, which was found in an inhumation in a lead sarcophagus dated to the late 3rd century AD. The tapestry band is 7 cm wide and its surviving length is at least 50 cm, with warp counts of 30 threads/cm, and weft of 100 threads/cm. The silk yarn has no visible twist and measures 0.1 mm in diameter. The gold



Fig. 7.20. (left) Detail of the tabby textile from a tomb in Glyfada woven in single *z*-twisted yarn (Photo: Y. Spantidaki and C. Moulherat).



Fig. 7.21. (right) Detail of a fragment of a purple textile from Kerameikos with tapestry decoration in gold thread (Photo: Y. Spantidaki and C. Moulherat).

strip is *z*-twisted around the organic core which may be linen. The textile is most likely of Syrian origin and is comparable to similar finds from Naintré in France (Bédard *et al.* 2005; also *cf.* Alfaro in this volume).

Kerameikos, Athens

In a marble sarcophagus of the early 3rd century AD in the necropolis of Kerameikos, remains of a purple textile decorated in tapestry technique with gold threads were found, and now conserved in the National Museum of Athens (inv. No. 3626). The numerous tapestry slits are still visible and testify to the quality and fineness of the original decoration. The gold threads are *z*-twisted. Their diameter is between 0.8 and 1 mm and the thickness of the gold sheet is 0.15–0.2 mm. The thread count of the warp is estimated to be 30 threads/cm, and weft 150 threads/cm (Fig. 7.21).

Conclusions

This survey of the material accumulated during the last few years provides us with a glimpse of textile production in Greece from the Bronze Age until the Roman period and enables us to make some observations. It is possible to distinguish different textile traditions during various periods. The Bronze Age is characterised by balanced tabbies with an average thread count of 15–20 threads/cm, woven with S2*z*-plied yarn. The raw material used is mainly flax.

Beginning in the 1st millennium BC, there is a systematic appearance of single, mostly *z*-twisted yarn and the few plied threads are only used in one system. This period also inaugurates the appearance of weft-faced tabbies with a thread count reaching 60 threads/cm. This textile type is subsequently

found with even higher thread counts in Corfu during the 7th century BC and in Attica during the 5th century BC. These textiles coexist with other textile types, such as balanced tabby.

In the case of inhumations, the textile spectrum is wider, and this variety is doubtlessly connected to the presence of the garments of the deceased in the burial. However, when textiles associated with cremations deposited in metal urns are considered, they present a great homogeneity, notably demonstrated by the fine weft-faced wool textiles from Corfu or the balanced linen tabbies discovered in Attica. Could there be a link between specific funerary practices and certain textile types?

Homer's *Iliad*, the composition of which historians date from the end of the 9th century to the end of the 8th century BC, provides information on some of the rituals which are exemplified by many of the Greek finds. Notably it relates the funerals of Patroclus and Achilles, two of the protagonists who die during the Trojan War (Homer, *Il.* XXIII, 247–289; XXIV, 795–804). In both cases the ashes were deposited in a shroud after cremation. This package was then laid inside a metal urn, beneath a tumulus. These practices can be observed at Lefkandi, already at the beginning of the 10th century BC. The main preoccupation of the populations practising these rites was the preservation of the remains of the deceased and all, or part, of the grave goods. This is demonstrated by the care shown when placing the ashes in the urn, either by wrapping the ashes in a plain weave fabric, or by wrapping the urn itself. Both these practices can sometimes be found in the same grave. The origin of this ritual seems to date back to the onset of the Iron Age in Greece *i.e.* the Geometric period, or the end of the 11th century BC.

Tomb	Object	Weave	Twist		Diameter (mm)		Thread count/cm		Fibre
			Sys. I	Sys. II	Sys. I	Sys. II	Sys. I	Sys. II	
Kalyvia <i>A. Tsaravopoulos*</i>	ceramic urn	weft-faced tabby	z	no visible spin	0.01–0.15	0.05–0.08	20–25	60–100	linen
Marathon <i>M. Oikonomakou</i>	bronze urn	balanced tabby	z	z	0.1–0.3	0.1–0.3	14	18	linen
Hellenico <i>K. Kaza</i>	bronze urn	balanced tabby	z	z	0.2	0.2	20	28	linen
Moschato <i>M. Petritaki</i>	bronze urn -T1	balanced tabby	z	z	0.2–0.3	0.2–0.3	16–18	20–24	linen
	bronze urn -T2	balanced tabby	z	z	0.08–0.1	0.08–0.1	32	32–40	linen
Maroussi <i>D. Skilardi</i>	bronze urn -T1	balanced tabby	z	z	0.2–0.25	0.2–0.25	24	28	linen
	bronze urn -T2	weft-faced tabby	z	z	0.14–0.19	0.11–0.17	30	70	linen
Merenda <i>O. Kakavogianni</i>	bronze urn	balanced tabby	z	z	0.5	0.5	12–14	12–14	?
Koropi	bronze urn -T1	balanced tabby	z very high	z very high	0.12–0.2	0.11–0.19	27–28	28–30	linen
	bronze urn -T2	balanced tabby	z	z	0.16–0.20	0.14–0.16	17	24–26	linen
Trachones	bronze urn -T1	weft-dominant tabby	z	z	0.18–0.25	0.21–0.32	16	27	cotton**
	bronze urn -T2	weft-faced tabby	s	s	0.27–0.36	0.24–0.38	18	36	?
	bronze urn -T3	balanced tabby	z	z	0.3–0.4	0.3–0.4	14–16	18	hemp
Eleusis <i>G. Mylonas***</i>	bronze urn	balanced tabby	z	z	?	?	18	17	linen
Egine	bronze urn	balanced tabby	z high	z high	0.24–0.27	0.24–0.27	15	16	linen
Kamatero <i>B. Rozaiki</i> X400/7805	bronze urn	weft-faced tabby	z	z very low	0.2	0.15	20	100–120	wool

* The names in italics are of the archaeologists responsible for the respective excavations.

** The fibre identification of the Trachones textiles was carried out by B. Zisis (Zisis 1955, 590–591).

*** The study and conservation of the textiles from Eleusis were carried out by B. Zisis (Zisis 1955, 589–590).

Table 7.5. Summary of the main qualitative and quantitative characteristics of samples of textiles from the funerary urns discovered in the region of Athens.

Textile	Special features	Weave	Twist		Diameter (mm)		Thread count/cm		Fibre
			Sys. I	Sys. II	Sys. I	Sys. II	Sys. I	Sys. II	
1	–	compound tabby	z	z	0.2	0.2	24	45	silk
2	–	compound tabby	z	z	0.1	0.1	24–26	27–30	silk
3	starting border	weft-faced compound tabby	s very low	z high	0.05–0.1	0.12	20	120	silk
		weft-faced compound tabby	s very low	z high	0.1–0.15	0.1–1.5	20	50–80	silk
4	net	compound tabby	z	z	0.03–0.1	0.03–0.1	40–45	40–45	silk
5	embroidery	compound tabby	z	z	0.05	0.05	40–45	40–45	silk

Table 7.6. Summary of the main qualitative and quantitative characteristics of textile samples from the bronze urn discovered in tomb HTR₇₃ at Kerameikos (After Hundt 1969).

Site	Object	Weave	Twist		Diameter (mm)		Thread count/cm		Fibre	Date
			Sys. I	Sys. II	Sys. I	Sys. II	Sys. I	Sys. II		
Salamis Salamine X400/7805	bronze mirror	balanced tabby	z	z	0.2	0.2	24	24	?	Classical period
Argyroupolis <i>K. Kaza</i>	bronze mirror	weft-faced tabby	s	s	0.35–0.5	0.40–0.46	10	22	linen	Classical period
Argyroupolis X315/7736	iron strigil	weft-faced tabby	?	S2z	0.35	0.53–0.62	12	20	linen	?
Moschato <i>M. Petritaki</i>	iron dagger	weft-faced tabby	s	s	0.5	0.5	8	20	linen	?
Falère <i>M. Petritaki</i>	iron pin	balanced tabby	z	z	0.5	0.5	12	12	linen	Hellenistic period
Dafni X303/7724	bronze strigil	weft-faced tabby	z low	z	0.15–0.18	0.20–0.24	16	28	linen	Hellenistic period
Aigaleo X312/7733a	iron strigil	weft-faced tabby	s	s	0.43–0.47	0.36–0.40	12	36	linen	Hellenistic period
Ano Voula X179/7628	iron knife	weft-dominant tabby	z	z	0.19–0.23	0.17–0.24	18	24	bast	?
Neos Kosmos X257/7690a	iron blade	balanced tabby	z	z	0.28–0.33	0.29–0.33	14	16	bast	?
Ambelakia Salamine <i>I. Dekoulakou</i> X389/4156	iron strigil	?	?	?	?	?	?	?	wool	Hellenistic period
Ambelakia 85 Salamine <i>I. Dekoulakou</i>	iron strigil T.1	balanced tabby	z	z	0.2–0.25	0.2–0.25	24	24	wool	Hellenistic period
Ambelakia 85 Salamine <i>I. Dekoulakou</i>	iron strigil T.2	weft-dominant tabby	s	s	0.35–0.45	0.35–0.45	12	24	bast	Hellenistic period
Ambelakia Salamine <i>I. Dekoulakou</i> 6471	iron nail	balanced tabby	z	z	0.27–0.43	0.29–0.41	18	14	linen	?
Ambelakia M15 Salamine <i>M. Pologiorji</i>	iron strigil T.1	weft-faced tabby	s	s	0.36–0.49	0.45–0.56	10	18–20	linen	Hellenistic period
Ambelakia M15 Salamine <i>M. Pologiorji</i>	iron strigil T.2	weft-faced tabby	z	s and no visible twist	0.34	0.16–0.25	16	32	wool	Hellenistic period
Ambelakia M21 Salamine <i>M. Pologiorji</i>	iron strigil T.1	weft-faced tabby	z	S2z	0.5–0.6	0.43–0.53	10	20–22	wool	Hellenistic period
Ambelakia M21 Salamine <i>M. Pologiorji</i>	iron strigil T.2	weft-dominant tabby	s	s	0.23–0.30	0.30–0.34	14	22	linen	Hellenistic period

Table 7.7. Summary of the main qualitative and quantitative characteristics of textiles from Attica dated to the Classical and Hellenistic periods.

Site	Object	Weave	Twist		Diameter (mm)		Thread count/cm		Fibre	Date
			Sys. I	Sys. II	Sys. I	Sys. II	Sys. I	Sys. II		
Grotto of Euripides, Salamis <i>Y. Lolos</i>	bronze coin	balanced tabby	s	s	0.43–0.45	0.39–0.55	8	8	linen	3rd c. AD
Glyfada <i>K. Kaza</i>	ceramic tile	balanced tabby	z	z	0.5–0.6	0.8	9	10	wool	3rd–4th c. AD

Table 7.8. Summary of the main qualitative and quantitative characteristics of textiles from Attica dated to the Roman period.

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ITALY

Neolithic period	6000–3300 BC
Chalcolithic/Eneolithic period	3300–2300 BC
Early Bronze Age	2300–1700 BC
Middle Bronze Age	1700–1350 BC
Late Bronze Age	1350–1200 BC
Final Bronze Age	1200–1000 BC
Iron Age/Villanovan	1000–750/700 BC
Orientalising period	750/700–600 BC
Archaic period	600–475/450 BC
Classical period	475/450–300 BC
Hellenistic period	300–30 BC
Roman period	30 BC–AD 400

ITALY



Map 8.1. Italy. Sites mentioned in Chapter 8:

- | | | |
|------------------------------|--------------------------|-------------------------------|
| 1 Barche di Solferino | 10 Gricignano d'Aversa | 19 Palu di Livenza |
| 2 Borno | 11 Grotta di Santa Croce | 20 Romagnano Loch |
| 3 Castellaro del Vhò | 12 La Marmotta | 21 Santa Rosa di Poviglio |
| 4 Castione dei Marchesi | 13 Lagozza di Besnate | 22 Santa Caterina-Castelverde |
| 5 Croce del Papa | 14 Lucone di Polpenazze | 23 Similaun |
| 6 Fiavé Carera | 15 Molina di Ledro | 24 Somma Lombardo |
| 7 Fornace Grandi di Bondeno | 16 Montemerano | 25 Valle delle Paiole |
| 8 Forno del Gallo a Beneceto | 17 Olmo di Nogara | |
| 9 Great Rock of Naquane | 18 Ossimo | |

Italy: Neolithic and Bronze Age

Marta Bazzanella

Introduction

This chapter examines archaeological textiles of Neolithic and Bronze Age Italy. The prehistoric textile archaeology of Italy is relatively well documented. The majority of notable finds come from waterlogged environments and date to the Bronze Age. In the northern Alpine region (*cf.* Médard in this volume), the number of sites where textile fragments have been found is significantly higher than in the areas south of the Alps. This disparity of documentation, however, does not mean that textiles were less common in the Apennine Peninsula compared to the continent. The textile craft was based on the same technology both north and south of the mountain barrier, as demonstrated by the indirect evidence of spindle whorls, loom weights, combs, weaving swords and knives, found in settlements. Textiles were produced in the same way and even a single find can be significant in this respect. Simply, more extensive research has been carried out north of the Alps (Bazzanella and Rast-Eicher 2003).

As far as the methods of obtaining information on textiles are concerned, the meagre documentation available (Table 8.1)

may be supplemented by the data on the tools connected with textile production, for instance, spindle whorls and loom weights which were made of materials that survive well in archaeological contexts: clay, stone and, sometimes, bone.

Chronological and Cultural Background

The first cultural manifestations of the Bronze Age south of the Alps appear slowly and gradually: the Neolithic tradition, more so than Eneolithic, evolved almost imperceptibly, without drastic changes or interruptions. South of the Alps, the Bronze Age (2200–900 BC) is first defined by the Polada culture and, later, by the so-called Terremare culture. In peninsular Italy, the beginnings of the Apennine culture can be discerned, which establishes itself during the Middle Bronze Age. In Sardinia, the Nuragic civilisation appears, reaching its apogee towards the end of the Bronze Age. Sicily and the Aeolian Islands are defined by the Castelluccio and Capo Graziano cultures (Fasani 1984; Bietti Sestieri 2010).

The Polada culture, which comprises the earliest phase of the Bronze Age in the Po

Table 8.1. Italian sites with textile finds from the Neolithic and Bronze Age.

Site	Period	Conservation	Finds
Barche di Solferino (MN)	EBA	waterlogged site	yarns
Castellaro del Vhò (CR)	MBA	waterlogged site	twining
Croce del Papa, Nola (NA)	EBA	volcanic ash	textiles and basketry
Castione dei Marchesi (PR)	MBA	waterlogged site	textile and basketry
Fiavé Carera (TN)	EBA/MBA	waterlogged site	basketry
Gricignano d'Aversa (CE)	EBA	mineralisation	textile
Grotta del Papa di Bisceglie (BA)	Neolithic	dry conditions	basketry
Lagozza di Besnate (VA)	Neolithic	waterlogged site	twine
La Marmotta, Anguillara Sabazia (RM)	Neolithic	waterlogged site	yarns, textiles, basketry
Lucone di Polpenazze (BS)	EBA	waterlogged site	textiles and basketry
Molina di Ledro (TN)	EBA/MBA	waterlogged site	yarns, textiles and basketry
Olmo di Nogara (VR)	MBA/LBA	mineralisation	yarns, textiles
Santa Caterina-Castelverde (CR)	MBA	mineralisation	fibres
Similaun val Senales/Schnalstal (BZ)	Eneolithic	frozen in glacier	twine and fur
Somma Lombardo (VA)	LBA	mineralisation	yarns, textiles
Valle delle Paiole, Cortefranca/Adro (BS)	EBA/MBA	waterlogged site	textiles

Fig. 8.1. Twined bast fibre from Lagozza di Besnate, Late Neolithic (After Bazzanella et al. 2003, 184).



Valley, represents a moment of cultural unification of the Alpine and Po territories. It is documented by numerous pile settlements situated along the shores of Alpine and pre-Alpine lakes of glacial origins or in their morainic environment. The use of the pile dwellings is a phenomenon documented south

of the Alps from the Early Neolithic on and continues in some cases until the end of the Early Iron Age, even if the occupation of the same settlement rarely continues uninterrupted over a long period of time.

It is in the sphere of the Polada culture that the most significant textile finds of the Apennine Peninsula belong, a fact certainly connected to an intensified human frequentation of the lakesides in comparison to the preceding periods. The evidence of occupation of the lakeshores during the Neolithic period is not as well documented as during the Bronze Age (Guidi and Bellintani 1996).

Research History

In contrast to the contemporary Swiss finds, textiles of the Neolithic and Bronze Ages which have been recovered in the Terremare district of northern Italy since the 19th century received relatively little attention until the 2002 exhibition at Riva del Garda which brought together for the very first time a number of such Bronze Age fragments (Bazzanella *et al.* 2003). At present, they are by far the best published archaeological textiles found in Italy. The numerous material from Molina di Ledro has drawn the attention of researchers since the first textile fragments came to light in 1937 (Battaglia 1943; Perini 1970) and has recently been published in a volume comprising a catalogue of textiles and textile tools found at the site (Bazzanella and Mayr 2009). Many of the Neolithic and Bronze Age finds are relatively recent, for example, the mummy of Similaun which came to light in 1991, the

Neolithic settlement La Marmotta found in 1989 and Croce di Nola del Papa discovered in 2001, and are still undergoing comprehensive investigations.

Neolithic and Eneolithic Period

While the finds dating to the Neolithic period are few and are generally more related to basketry than to textiles, they are of great importance for our understanding of textile development in Italy as a whole. The earliest finds come from La Marmotta near Anguillara Sabazia in Lake Bracciano, in the province of Rome, where cordage, textiles and basketry, as well as seeds and capsules of cultivated flax were found, dated to 5690–5260 BC (Fugazzola Delpino 1998; Rottoli 2003). A Neolithic mat with a spiral pattern was found in Grotta di Santa Croce at Bisceglie in the province of Bari. Its poor state of conservation, however, did not permit fibre identification (Boscato, Gambassini and Ronchitelli 2002). Another find comes from Lagozza di Besnate, in the province of Varese (Fig. 8.1), where a piece of twine of undetermined tree bast, attributed to the Late Neolithic, was recovered (Bazzanella *et al.* 2005a).

The most important find dating to the Eneolithic period, marking a milestone in prehistoric textile research, is the famous Iceman or the Man of Similaun (Fig. 8.2), discovered in Val Senales, province of Bolzano in 1991, at 3210 m above sea level, near the border with Austria (*La mummia dell'età del Rame* 1999; Fleckinger 2003; 2007). With the mummy was recovered a complete costume destined for the high altitude climate. Although the costume did not include woven garments, there were articles of skin¹ and twined fibre: a tunic, a loincloth and leggings made of strips of goatskin, a lambskin belt, a bearskin hat, deerskin shoes with twined structure, a mat twined of plant fibre (Alpine *Graminaceae* sp.) with plied warp; and a twined dagger sheath.

Bronze Age

The majority of textile finds dated to the Bronze Age (see Table 8.1) originate from waterlogged contexts. The most important Bronze Age sites are the pile dwellings of Molina di Ledro in the province of Trento and Lucone di Polpenazze in the province of



Brescia. Both these sites yielded a conspicuous number of finds, while only single finds come from other sites.

Molina di Ledro, province of Trento

Located in western Trentino at 654 m above sea level, on the shores of the homonymous dam lake, the settlement of Molina di Ledro was discovered due to a drastic lowering of the lake water level for the irrigation of the lake basin. Approximately 5000 m² were uncovered in the course of the excavations conducted between 1929 and 1980. The discovery of the first textile remains goes back to 1937 and included balls of yarn, woven fabric, tufts of raw fibre, rope and cord fragments (Battaglia 1943). Yarns and textiles come from the earliest occupation levels

Fig. 8.2. Iceman or the Man of Similaun, Eneolithic Period (Photo: South Tyrol Museum of Archaeology – www.iceman.it).

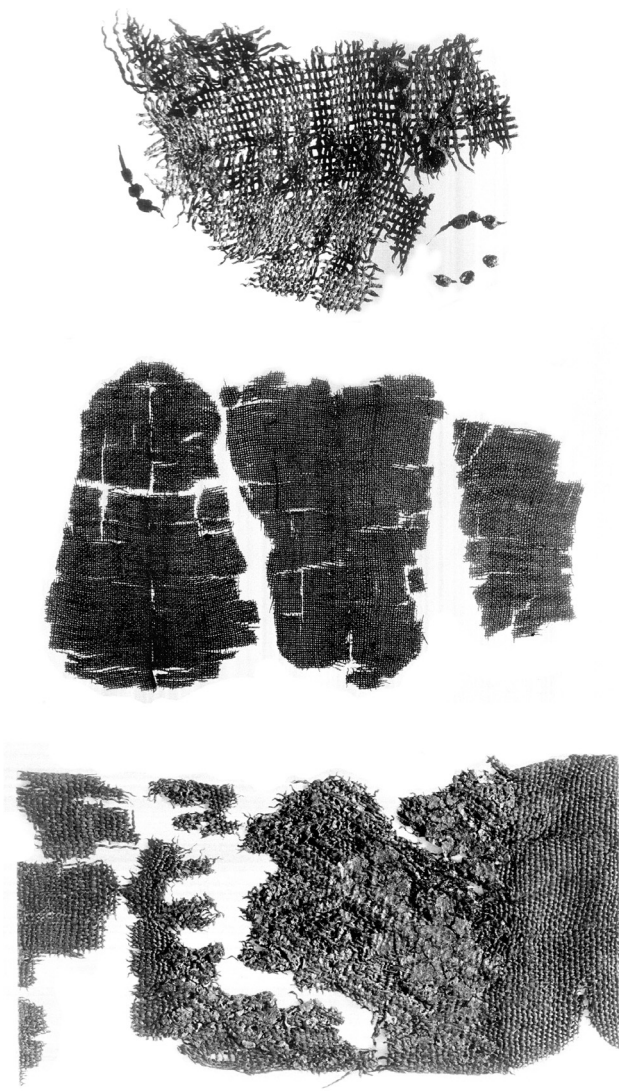


Fig. 8.3. Textiles from Molina di Ledro, Early–Middle Bronze Age (After Bazzanella et al. 2003, 161, 168, 169).



Fig. 8.4. Ball of linen yarn from Molina di Ledro, Early–Middle Bronze Age (After Bazzanella et al. 2003, 173).

dated to the Early Bronze Age. In addition, the archaeological investigations yielded numerous materials connected to textile production, such as spindle whorls, spools and loom weights, which permit a partial reconstruction of textile craft at the site during this period. The total number of tools related to textile activities at Ledro consists of 107 loom weights and 150 spindle whorls.

The textile corpus from Molina di Ledro comprises 297 finds.² Among these are 83 textile fragments, 1 fragment of twine, 2 balls of yarn, 195 yarn fragments, 12 cordage remains and 4 finds of raw or prepared fibre (Figs 8.3–8.4; Bazzanella and Mayr 2009).

The materials in plant and animal fibre from Molina di Ledro constitute a unique find for the Bronze Age in northern Italy, both for the quantity of the excavated remains, and for the presence of at least two complete items: a long band with a rhomboid decoration (Fig. 8.3. bottom) and a belt with a buttonhole and a fringe. Of notable interest are also a textile fragment with festoon embroidery, another fragment with attached decorative seeds of *Lithospermum* (Dalla Fior 1940), and a fragment of a simple mesh net, interpreted as a hairnet or a purse. All the remains are completely or partially carbonised. The fibre used to make textiles is primarily flax, but there is also evidence for the use of tree bast and, in one case, wool, which was used for sewing a buttonhole and a fringe onto the belt. The yarn diameters range between 0.3 and 0.8 mm (Table 8.2).

The documented weaves include tabby and twill, the latter however present only in one find: the band decorated with a concentric lozenge pattern. The decorative motif is repeated on two segments of the ground weave and is achieved through a cross between two alternating weaves, tabby and twill, which creates concentric lozenges. The band measures 209 cm in length and is 6.8 cm in width. The experimental reconstruction of the decorative motifs indicates the use of a loom to weave this textile (Bazzanella, Belli and Mayr 2003).

Fiavé Carera, province of Trento

The moor of Fiavé, located only a few kilometres from Molina di Ledro, occupies a basin of an ancient lake of late glacial origin at 645 m above sea level, which has now completely disappeared. Noted as an archaeological site

Table 8.2. Technical characteristics of Bronze Age textiles from Italy.

Site	Thread twist	Thread diameter warp (mm)	Thread diameter weft (mm)	Thread count warp (threads/cm)	Thread count weft (threads/cm)	Fibre
Lucone di Polpenazze (BS)	S2z	0.3–0.5	0.4–0.6	12–18	12–16	flax
Molina di Ledro (TN)	S2z	0.3–0.8	0.3–0.7	12–16	10–14	flax, tree bast*, wool
Castione dei Marchesi (PR)	Z2s	1.3	1.3	8	6	wool
Valle delle Paiole, (BS)	Z2s	0.5–1 mm	0.5–1 mm	7–10	5–7	tree bast, wool
Gricignano d'Aversa (CE)	S2z	0.2–0.5**	0.2–0.3***	–	–	hemp

* The thread diameter of tree bast yarn is 0.5–1 in warp and weft and the thread count is 6–7 threads per cm.

** The small dimensions of the finds do not permit us to distinguish between warp and weft. The measurement refers to the threads parallel to the larger dimension of the find (Giuliani and Salerno 2003).

*** The number refers to the threads parallel to the smaller dimension of the find (Giuliani and Salerno 2003).

since the second half of the 19th century, it was excavated between 1969 and 1976 by Renato Perini, and from 1981 onwards a series of interdisciplinary investigations of the entire moor area was undertaken. This resulted in the discovery of an uninterrupted sequence of materials and various building typologies in use between the Recent Neolithic and the Recent Bronze Age. Due to the stratigraphic sequence of numerous identifiable structures and of wooden materials found at Fiauvé, this is the site of reference for the subalpine Bronze Age (Perini 1984). Although neither textiles nor yarns were found at Fiauvé, there is abundant evidence of baskets of various sizes, and of textile tools.

Remains of at least six twined items have been documented, mainly made of willow and viburnum twigs, dated to the Middle Bronze Age (Fiauvé 4°/5°–6°). Of notable interest is the twined headgear of a relatively complex structure, known as the helmet of Fiauvé and interpreted as a prestige or ceremonial object (Fig. 8.5). The headgear is conical and has a narrow brim, which runs just above the base and was probably intended either as a decoration or as a reinforcement of the circumference of the headgear. For the making of the spiral structure of the headgear, a framework was made of pine twigs, sectioned at the sides, straightened and bent in a circle. This framework is covered by a compact and continuous spiral coiling, made with ribbons cut of viburnum branches, stripped and sectioned lengthwise. In correspondence with the turns of the framework, the helmet also includes a fine cord made of common reed (*Phragmites communis*), which runs horizontally. At the tip of the helmet was an opening, into

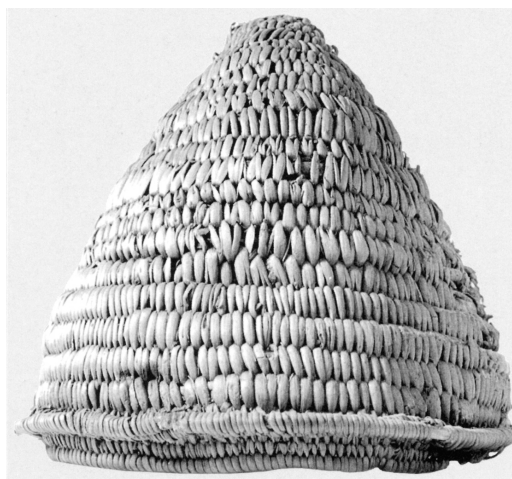


Fig. 8.5. The helmet of Fiauvé Carera, Middle Bronze Age (After Bazzanella et al. 2003, 146).

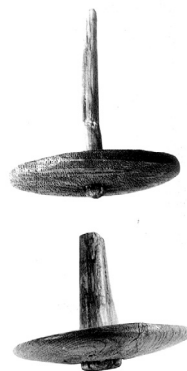


Fig. 8.6. Fragmentary wooden spindles with wooden spindle whorls from Fiauvé Carera, Middle Bronze Age (After Bazzanella et al. 2003, 137).

which some other decorative element may have been inserted (Perini 1987).

The absence of textiles in comparison to Molina di Ledro, may be explained by the poor preservation of textile fibre, due to the nature of the soil. At the same time, while flax seeds are not found at Ledro, they have been recovered at Fiauvé (Karg 1998), thus documenting the cultivation of this plant, most likely for textile use. Furthermore, a variety of

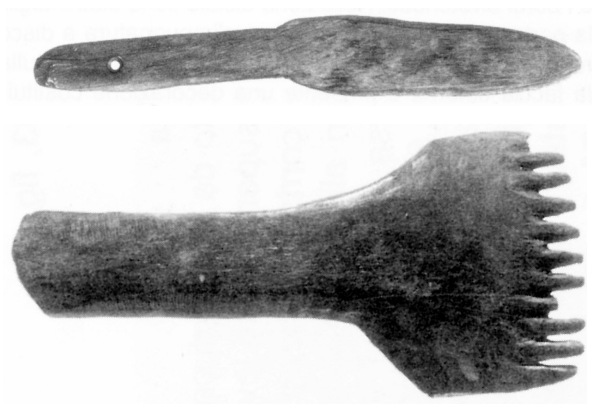


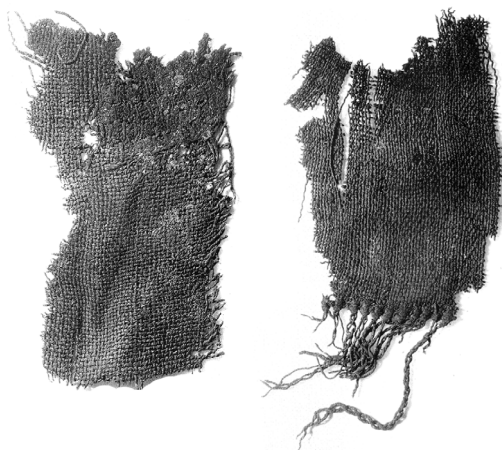
Fig. 8.7. (top) Beating knife from Fiavè-Carera, Early-Middle Bronze Age (After Bazzanella et al. 2003, 141).

Fig. 8.8. (above) Beating comb from Fiavè-Carera, Early-Middle Bronze Age (After Bazzanella et al. 2003, 141).



Fig. 8.9. (right) Horn comb from Fiavè-Carera, Early-Middle Bronze Age (After Bazzanella et al. 2003, 142)

Fig. 8.10. (right) Textiles from Lucone di Polpenazze, Early Bronze Age (After Bazzanella et al. 2003, 192, 193).



textile tools are documented at Fiavé, including 25 loom weights, 3 spindle whorls, 12 wooden spindles without a whorl and three simple wooden spindles (Fig. 8.6), a wooden beating

knife (Fig. 8.7), and wooden and horn combs (Figs 8.8–8.9; Perini 1984; 1994).

Lucone di Polpenazze, province of Brescia

Important evidence of textile production dated to the Early and Middle Bronze Age comes from the waterlogged settlement of Lucone di Polpenazze, located near a valley of a homonymous infra-morainic basin at 253 m above sea level. Six textile fragments (Fig. 8.10) and 24 small twinings and cords have been recovered in excavations conducted in the area of Lucone since 1969 (Simoni 1970). The special character of the textile collection from Lucone is represented by the use of tabby, which is characteristic for the Bronze Age, and by the notable precision of execution of not only the textiles but also of their fringed borders, present on four of the six textile fragments, all in linen (see Table 8.2). The occurrence of fringed borders on the textiles, formed by variously twisted or braided threads, may have a symbolic significance, as suggested for the fringed rectangles depicted on the rocks of Ossimo and Borno in Valcamonica (Casini 1994).

Barche di Solferino, province of Mantova

Four linen yarn balls are noted in the literature describing the waterlogged settlement of Barche di Solferino, attributed to the Polada culture (Zorzi 1940, Mezzena 1966). The technical data are however missing. Besides the yarn, this site has yielded neither textiles nor basketry, although this may be due to the poor recovery at the site.

Castellaro del Vhò, province of Cremona

The settlement is located in the Piadena municipality, on the fluvial summit near the natural channel of the river Oglio. The excavations carried out in 1910–1912 (by P. Castelfranco and P. Patroni) and subsequently in 1995–1999 (by the Civiche raccolte archeologiche di Milano) have documented two habitation phases: the first attributed to the beginning of the Middle Bronze Age and the second to the advanced Recent Bronze Age. Initially, during the Middle Bronze Age, the settlement was located on the northern bank and consisted of a few palisaded huts. Subsequently, it expanded to about 2 hectares along the top part of the summit, which despite its elevated position was at times subjected to

inundations (Frontini 2001). From the Middle Bronze Age context comes a basket fragment, made by the twining of raw willow twigs, which contained numerous oak twigs and leaves, probably collected as foraging (Frontini 2003). The site has also yielded numerous textile tools, in particular loom weights in a variety of shapes (Frontini 1997).

Valle delle Paiole, province of Brescia

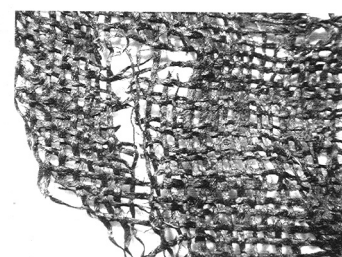
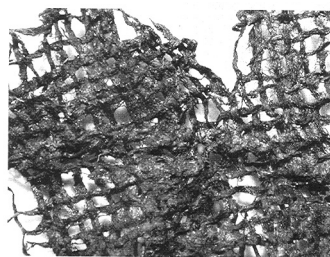
The *palafitta*/palisade settlement of Valle delle Paiole was discovered in 2001, at the border between the municipalities of Cortefranca and Adro, in the area of a small lake basin, which today is almost completely filled in. The habitation yielded abundant archaeological documentation of the Early and Middle Bronze Ages (Poggiani Keller 2003). The waterlogged environment furthermore preserved a series of textile fragments made of tree bast, woven in tabby with a yarn of 0.5–1 mm in diameter (see Table 8.2), and probably belonging to the same textile (Fig. 8.11).

Castione dei Marchesi, province of Parma

Located in the municipality of Fidenza, the terramara of Castione dei Marchesi was intensively exploited for agricultural purposes as a quarry for soil and has been known as a site of archaeological interest since 1843. However, it was only in 1861 that scientific investigations were begun by Luigi Pigorini and Pellegrino Strobel (Strobel and Pigorini 1864). The excavations uncovered a stratification of several metres of cultural layers, containing a well-preserved pile dwelling and several successive floor levels. The pile dwelling settlement extends over 14 hectares. Based on the archaeological documentation, the site was dated from the Middle Bronze 1–2 (16th century BC) to the Late Bronze Age (13th century BC). Among the material recovered are several baskets and a small textile fragment (8 × 4 cm) in sheep wool woven in tabby, dated to the Middle Bronze Age (Fig. 8.12). The wool has very fine underwool and many coarse kemps (Rast-Eicher 1997).

Croce del Papa, province of Naples

Outside the Alpine area, interesting finds have been recovered in Croce del Papa near Nola, in the province of Naples, where the Vesuvius' pumice eruption of Avellino sealed a settlement of the Early Bronze Age (1860–1680 BC, *facies*



of Palma Campania), of which 1500 m² have been excavated. The settlement was flooded by volcanic ash and mud, which resulted in a kind of cast of the village, thus preserving the huts to a height of 1.30 m. Negative casts of baskets, textiles and cords are preserved inside some of the huts (Albore Livadie *et al.* 2002).

Other Finds

In other cases, the preservation is due to the mineralisation of fibres in the presence of metal, copper or bronze. These finds, recovered mostly from funerary contexts, are generally very small, often only single fibres or minute textile fragments, indicating the presence of funerary cloth. Their technical parameters are often difficult to ascertain (Rottoli 2005). Such is the case for the Middle-Late Bronze Age necropolis of Olmo di Nogara in the province of Verona (Castiglioni *et al.* 2005); the Late Bronze Age necropolis of Somma Lombardo in the province of Varese (Castiglioni 1995); a dagger from a hoard of Montemerano (Fig. 8.13; Gandolfo 1981, 362–365); and the Middle Bronze Age terramara Santa Caterina-Castelverde in the province of Cremona

Fig. 8.11. (top) Textile from Valle delle Paiole, province of Brescia, Early-Middle Bronze Age (After Bazzanella *et al.* 2003, 198).

Fig. 8.12. (bottom) Textile from Castione dei Marchesi, Middle-Late Bronze Age (Photo: M. Gleba © Museo Archeologico di Parma).

Fig. 8.13. Textile pseudomorph on a bronze weapon from Montemerano, Early Bronze Age (After Gandolfo 1981, 361 Pl. 94 and 365 Pl. 96).

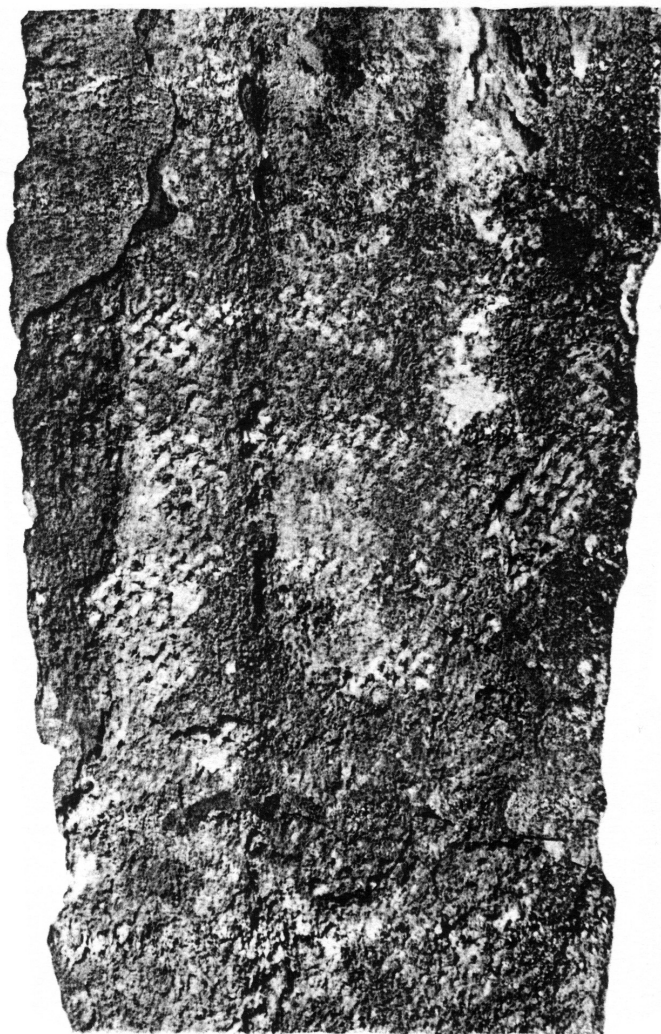
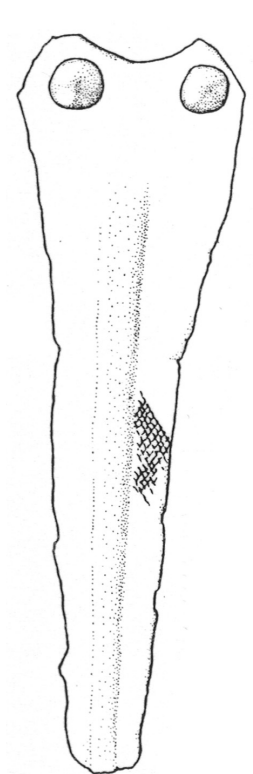
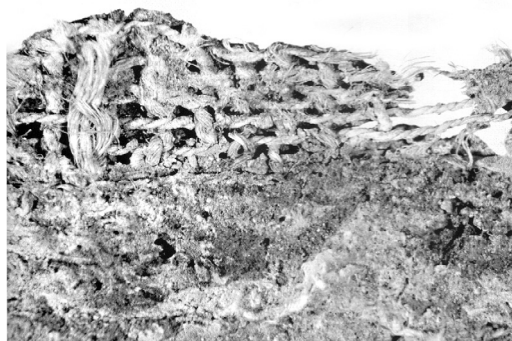


Fig. 8.14. Textile from Gricignano d'Aversa, Eneolithic-Early Bronze Age (After Bazzanella et al. 2003, 211).



(Rottoli 2005). Only in the case of a minute textile fragment preserved in a mineralised state in contact with a metal blade, possibly a dagger (Artioli *et al.* 2002; Giuliani and Salerno 2003), found at Gricignano d'Aversa, in the province of Caserta (Fig. 8.14), was it possible

to determine the fibre, hemp, and the type of weave, tabby (see Table 8.2).

Tools

As far as spinning is concerned, information is provided by spindle whorls which are numerous on all the sites. Spindle whorls come in a variety of shapes, although discoid and cylindrical types seem to dominate in the earlier period. The weight of spindle whorls has been recorded at the Neolithic site of Lagozza, where the range is 30–40 g (Baioni *et al.* 2003, 101) and at the Middle Bronze Age S. Rosa di Poggio, where the range for over 100 items recorded is 3–64 g (Bernabó Brea, Bianchi and Lincetto 2003, 111).

The textiles were woven on vertical warp-weighted looms, as documented indirectly by

loom weights and iconographic evidence. The earliest representations of such a loom, in fact, come from Italy: seven depictions were carved into the Great Rock of Naquane in Val Camonica, dated to the 14th century BC (Fig. 8.15; Anati 1959, fig. 5; 1961, 138–142). Archaeologically, warp-weighted looms are best documented by lines of loom weights, which allow the localisation of the exact position of looms inside the dwellings, as well as their width. In a Neolithic hut at Fornace Grandi di Bondeno (Ferrara), about 50 loom weights were found on the floor (Cremonini and Steffè 1987). Several sets of loom weights ranging between 12 and 16 in number were found in a Bronze Age habitation of S. Rosa di Poviglio (Fig. 8.16; Rast-Eicher 1997, 550; Bernabò Brea 1997; Bernabò Brea, Bianchi and Lincetto 2003, 112–119). Similar discoveries were made at Forno del Gallo a Beneceto (Bernabò Brea, Bianchi and Lincetto 2003, 116), Romagnano Loch in Trentino (Perini 1994) and Fivè-Carera (Perini 1994, 1019), all dated to the Middle Bronze Age.

The weight of loom weights ranges between 290 and 1300 g for the sites of S. Rosa di Poviglio (Fig. 8.16) and Forno del Gallo a Beneceto (Bernabò Brea *et al.* 2003); between 224 and 1180 g for Molina di Ledro; and between 690 to 730 g at Lagozza di Besnate (Baioni *et al.* 2003, 101). It should be noted that, during the transition between the Neolithic and the Bronze Age, it is possible to see a development from conical to cylindrical and ring-shaped weights (Bazzanella, Mayr and Rast-Eicher 2003).

Objects of semilunate or rheniform shape with rounded ends, perforated perpendicular to the length of the object seem to be found exclusively in the sites of the Late Neolithic Lagozza culture (Cornaggia Castiglioni 1955; 1964; 1965; Barfield 1971, 51, 52 fig. 23; Baioni *et al.* 2003). Their functionality as loom weights for a warp-weighted loom has been a matter of debate. Recently, experiments demonstrated various ways of how they could be used (Baioni *et al.* 2003, 104–106; Feldtkeller 2003).

Conclusions

The textiles of the Bronze Age on the Apennine Peninsula come primarily from the northern regions and are often connected to waterlogged settlement contexts: the pile

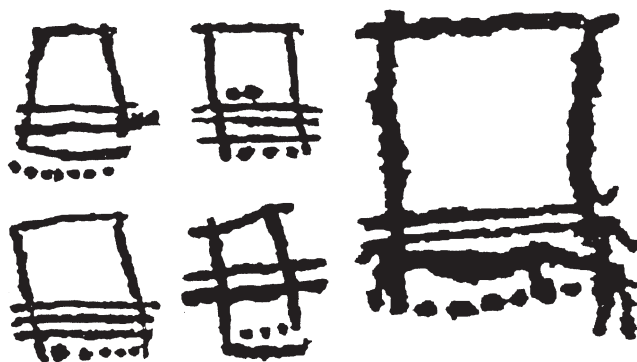


Fig. 8.15. Loom depictions from the Great Rock of Naquane, Middle Bronze Age (After Bazzanella *et al.* 2003, 93).

dwellings of the Polada culture of the Early Bronze Age or the *terremare* of the Middle Bronze Age. In fact, it is the preservation conditions of the waterlogged contexts which have provided most information about the textiles of this period so far, since they allow the perfect conservation of organic materials, thus providing us with technological parameters of the fibres and techniques used.

The Bronze Age witnesses the use of willow and viburnum for the making of baskets and headgear, while textiles are woven mainly in flax, but also in tree bast fibres and, occasionally, in wool or hemp (see Table 8.2). The tree bast fibres, noted for the Neolithic period, continued to be used during the Bronze Age, but not as the principal material. Instead, the cultivation of flax, documented already in the Early Neolithic, increased by the Late Neolithic (Rottoli 2003). This is probably connected to the intensification of weaving, as documented by the finds at Palù di Livenza (province of Pordenone), in the north-east of the peninsula (Corti *et al.* 1998). Wool makes its appearance during the Bronze Age, accompanied by a progressive reduction in dimensions and weight of the spindle whorls.

Tabby is the main type of binding used during prehistory. Tabby weaves are made with yarns of notable fineness, with a diameter 0.3–0.8 mm for linen, 0.5–1 mm for tree bast and 2.3 mm for wool. The thread count for linen textiles is 12–18 threads/cm in warp and 10–16 in weft. Tree bast textiles have a thread count of 7–10 threads/cm in warp and 5–7 in weft. The single wool textile has 8 threads/cm in warp and 6 in weft. At Molina di Ledro there is also evidence of twill although as a decorative technique.

Although the textile finds from water-

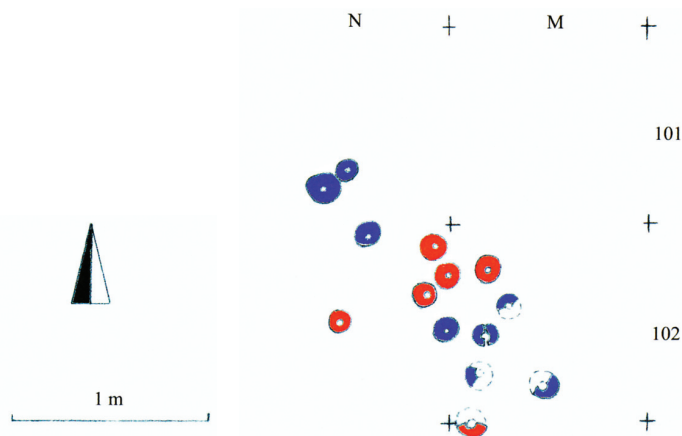


Fig. 8.16. Loom weights in situ, Vilaggio grande, S. Rosa di Poviglio, Late Bronze Age (After Bernabò Brea et al. 2003, 117 Fig. 6).

logged sites are not very numerous, these exceptional finds are of great importance for the understanding of the evolution of the European textile craft.

Original text translated from the Italian by Margarita Gleba.

Notes

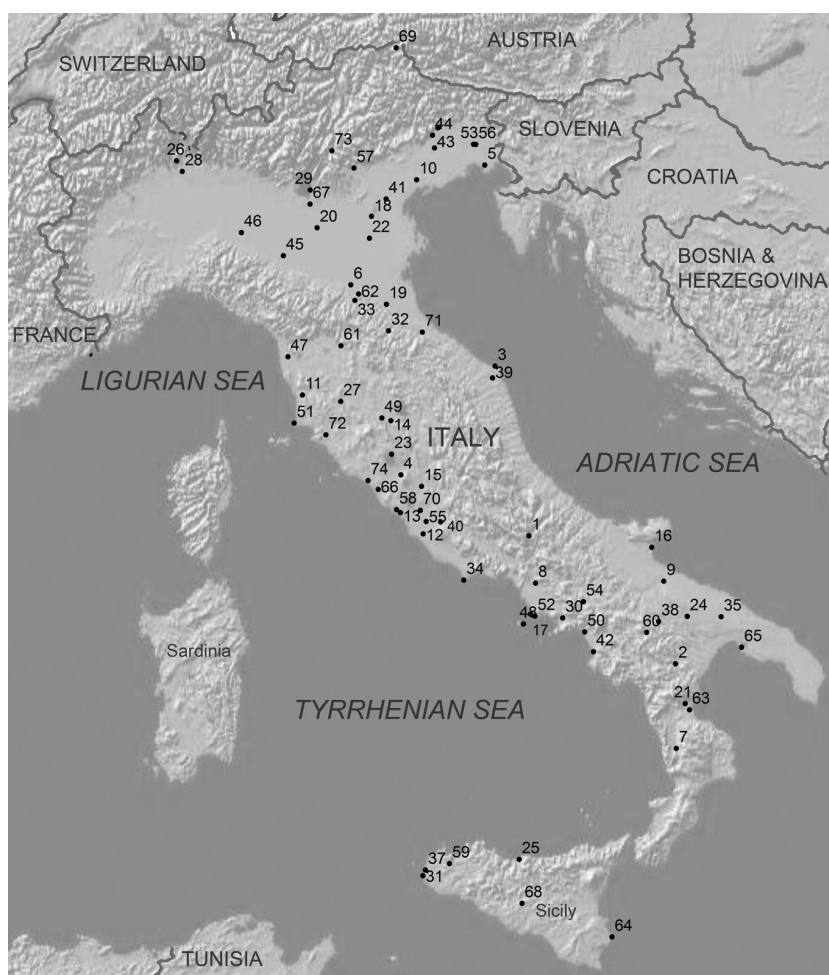
- 1 It should be kept in mind that production of skin garments must have been easier and less labour intensive compared to weaving. Hence, skin clothing has always coexisted with textiles, as demonstrated by the finds of Vedretta di Ries/Riesenferner (province of Bolzano) from the Early Iron Age. Here, at the margins of a glacial tongue at 2841 m above sea level, a pair of under-leggings, a pair over-leggings and a pair of inner shoes in wool, as well as numerous skin fragments came to light (Bazzanella et al. 2005b; cf. Gleba in this volume).
- 2 All the fragments of textiles and yarns were considered as single finds.

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ITALY



Map 9.1. Italy. Sites mentioned in Chapters 9, 10 and 11:

1 Alfedena	20 Forcello di Bagnolo S. Vito	39 Osimo	58 Sasso di Furbara
2 Alianello	21 Francavilla Marittima	40 Osteria dell'Osa	59 Segesta
3 Ancona	22 Frattesina	41 Padova	60 Serra di Vaglio
4 Aquarossa	23 Gran Carro	42 Paestum	61 Sesto Fiorentino
5 Aquileia	24 Gravina di Puglia	43 Palse	62 Settefonti
6 Bologna	25 Himera	44 Palù di Livenza	63 Sibari
7 Broglio di Trebisacce	26 Isolino di Varese	45 Parma	64 Siracusa
8 Cales	27 La Piana	46 Piacenza	65 Taranto
9 Canosa	28 Lagozza di Besnate	47 Pisa	66 Tarquinia
10 Casale di Rivalta	29 Lazise	48 Pithekoussai	67 Valeggio sul Mincio
11 Casale Marittimo	30 Longola di Poggiomarino	49 Poggio Bacherina	68 Vassallaggi
12 Castel di Decima	31 Marsala	50 Pontecagnano	69 Vedretta di Ries
13 Cerveteri	32 Mevaniola	51 Populonia	70 Veio
14 Chiusi	33 Monte Bibele	52 Pozzuoli	71 Verucchio
15 Civita Castellana	34 Monte Circeo	53 Pozzuolo del Friuli	72 Vetulonia
16 Coppa Nevigata	35 Monte Sannace	54 Pratola Serra	73 Volano San Rocco
17 Cuma	36 Montereale Valcellina	55 Rome	74 Vulci
18 Este	37 Mozia	56 Sammardenchia	
19 Faenza	38 Oppido Lucano	57 Santorso	

Italy: Iron Age

Margarita Gleba

Introduction

This chapter covers textile production in Italy during the first half of the 1st millennium BC. The sources for the study of textile production in ancient Italy are diverse, ranging from texts and iconography to archaeological materials. Ancient Italian art encompasses one of the most informative collections of visual data in the ancient Mediterranean, providing rich evidence on costume and utilitarian textiles, in particular for Etruscan culture. However, the most direct but paradoxically least explored type of evidence for ancient textile manufacturing activities consists of archaeological material, *i.e.* the textiles and tools used to produce them.

Although textiles surviving in their original form are relatively rare in Italy, almost all conditions of preservation can be found on the Apennine Peninsula (Rottoli 2005). The largest corpus consists of linen textile fragments found in various Neolithic and Bronze Age sites in the north of the peninsula, where they have been preserved by the basic conditions of the Alpine lakes (*cf.* Bazzanella in this volume). Wool textile fragments, on the other hand, have been recovered from burials, where they were conserved in waterlogged and/or acidic

environments; amongst these, the Verucchio and Sasso di Furbara groups are the most significant. A few Iron Age clothing articles were recovered from the Alpine glaciers (Dal Ri 1996; Bazzanella *et al.* 2005). Carbonised textiles of the Roman period preserved as a result of the eruption of Vesuvius are also of considerable interest (D’Orazio *et al.* 2000). The vast majority of textiles in Italy, however, has been preserved in association with metal objects and survive in the shape of minute traces on metal surfaces. The study of Italian archaeological textiles is still in its infancy and the overview presented here is necessarily preliminary.

Chronological and Cultural Background

The period covered in this chapter spans from the Early Iron Age to the beginning of the Romanisation of the Apennine Peninsula (*c.* 1000–400 BC). The upper end of this chronological period is the transition from the Bronze Age to the Early Iron Age in Italy. The lower chronological boundary is the time immediately preceding the Romanisation of the Apennine Peninsula. The period from the 10th through the 6th century BC is particularly



Fig. 9.1. Bronze patera with textile remains from Tomb G, Casale Marittimo, 7th century BC (Photo: M. Gleba).

important, as it is the time of transition from small villages of mostly egalitarian type to large urban centres with social stratification and specialised crafts. The large territory of the Apennine Peninsula with its varied topography and environment account for ancient Italy's cultural diversity. The nature of the evidence for each particular culture and region is unequal and heterogeneous.

The cultural processes that culminate in the Early Iron Age have their roots in the Bronze Age (Peroni 1971, 1989; Ridgway 1988, 624–628; Guidi and Piperno 1992; Cocchi Genick 1996). The Early Bronze Age was characterised by the multiplicity of subcultures or cultural *facies* (Peroni 1971), while in the Middle Bronze Age, Apennine civilization in Central Italy was relatively uniform. The Late Bronze Age has been subdivided into the Recent and Final phases. The Recent Bronze Age is also known as the Subapennine, being contemporaneous with the culture that characterised the greater part of Italy from the Po valley to southern Calabria (Pacciarelli 2000, 36). The Final Bronze Age corresponds

to the appearance of the Protovillanovan culture, so called because of its affinities with Villanovan cultural traits of the following period (Bartoloni 2002, 85). Its essential characteristics include an economy based on agricultural and metallurgical activities, a socio-political structure of aristocratic type marked by warrior ideology, the rite of cremation with the appearance of large necropoleis, a distinctive type of ceramics with varied decorative schemes, and a differentiated use of territory, the occupation of which was tied to its control.

The Early Iron Age has been recognised as the time to which the origins of most Italic peoples can be ascribed. From the break-up of a Protovillanovan unity emerged several cultures, which later developed into the major ethnic and linguistic entities of Pre-Roman Italy: Golasecca in the north-west; the Venetic culture in the north-east; the Villanovan culture in the central Tyrrhenian zone with Latium immediately south of it; the Picene culture in the central Adriatic; the Iapygian culture in Puglia; the *Fossakultur* in Campania and Calabria; and the Oenotrian culture in Basilicata. In addition to aboriginal cultures, starting in the 8th century BC, southern Italy and eastern Sicily were colonised by Greek settlers, while Sardinia and western Sicily were strongly influenced by a Phoenician presence.

In Italy, cultures with large territorial extension have been subdivided into smaller, local units, termed cultural *facies* (Pallottino 1939; Pacciarelli 2000), which are often defined in terms of ceramics excavated at settlement sites. Archaeological cultures and their *facies* can occasionally be equated with ethnic groups documented in historic sources; beginning in the Early Iron Age, these are characterised by the emergence of groups with strong identities (Pacciarelli 2000, 19). Since equating archaeological cultures to ethnicities is not always done judiciously, ethnic designations are used here only when generally accepted and demonstrated to correspond to specific assemblages of archaeological material.

The type of social organisation that was common in the Early Iron Age throughout the peninsula was characterised by a division into broad family groups. Each such group was dominated by a select elite headed by a male figure. These head figures adopted funerary customs in which weaponry and other prestige goods played a key role, thus promoting the

circulation of these items. The control of this economic circulation was kept in the hands of the elite groups. This economic inequality led to a further concentration and accumulation of wealth by a few families that eventually developed into an aristocracy (Cerchiai 1995, 62–64). By the end of the 8th century BC, many areas of Italy had a social organisation of gentilitial character in which elite groups controlled economic activities and mediated the relations with Greeks and other groups. Their power was expressed through the great richness of their funerary goods and the adoption of the banquet as an institution. The richness of some children's burials indicates that rank was hereditary.

In the period generally dated from 720 to 580 BC, Italy was flooded by a massive wave of luxury and prestige objects, many of which were imported from the eastern Mediterranean and the Near East. Brought for the most part by Levantine traders, such goods became indispensable elements that defined and legitimised aristocrats (Bartoloni 2000; Riva 2010). These goods in turn inspired local craftspeople to take up new techniques and produce works in similar styles. The term 'Orientalising' is thus used for both the new style and the period. Competition among the elite resulted in conspicuous consumption as illustrated by numerous high-status tombs, often characterised by monumental architecture. Some of the objects included in these 'princely tombs' also indicate the adoption of practices such as 'Homeric' burial, sympotic banqueting or hoplite warfare (Barker and Rasmussen 1998, 124–125). The extraordinary richness of the Orientalising tombs was never to be reached again in later periods.

During the first half of the 1st millennium BC, many parts of Italy underwent a social transformation from chiefdom-like village communities to societies with state characteristics, including urban structures, social stratification, the formation of market systems and private property, the appearance of writing and figurative art, and structured cult activities. The period from the 10th through the 6th centuries was particularly important. Organised production intensified significantly during these centuries, as did commercial exchange throughout and beyond the Italic sphere.

Until not so long ago, the most common explanation for the urbanisation of Italian settlements was contact with the founders of the Greek colonies in the south. Thanks to recent surveys and settlement excavations, this situation is starting to change. Archaeological evidence has demonstrated that proto-urban entities existed in Etruria and south Italy already in the 9th century BC, and that early states arose in the course of autochthonous development. The Tyrrhenian area was the core of the urban formation between the 10th and 8th centuries BC (Riva 2010). In the surrounding areas, this process occurred on a smaller scale during the course of the 7th and 6th centuries BC. This process was delayed in north Italy, while the eastern Adriatic and southern regions never achieved the level of urbanisation evident in the central Tyrrhenian area. The 6th century BC is regarded as the zenith of Etruscan civilisation in Italy. The military aristocracy gradually lost its preeminence and the social, economic and political power became concentrated in the hands of the mercantile elite. The cities of Etruria flourished, as did Rome, transformed into a truly urban centre by its Etruscan kings (Cornell 1995). Etruscan art and architecture thrived during the 6th century BC. The 5th century BC marks the beginning of the end of the Etruscan world. Rome, growing more powerful, soon turned its expansionist policy against Etruria and surrounding territories. Meanwhile, the north was being weakened by Celtic invasions starting in the late 5th century BC. By the time of the first Roman emperors, most of Italy underwent complete Romanisation (Barker and Rasmussen 1998, 262–296).

Textile production, being an industry of great cultural and economic importance, must be factored into any balanced assessment of the ancient Italian economy during the period under consideration. The majority of textiles and many textile tools have been found in burials. Italian burial practices during the 1st millennium BC include inhumation with deposition in a trench grave (*fossa*), and cremation, with remains deposited in an urn, which was then placed in a pit (*pozzi*) (Camporeale 1992, 38). Funerary data have been considered a primary source for the reconstruction of the social makeup of ancient communities (Bartoloni 2002, 32). The typology of the materials and their association within

burials, the examination of funerary ritual and structure, and the topographical analysis of a necropolis permit the identification of the sex, age and status of an individual, as well as the social structure and chronology of the community to which this individual belonged (Bartoloni 2002, 32–35; 2003).

Research History

Because the environmental conditions in Italy are generally not conducive to the survival of organic material, the study of ancient Italian textiles has progressed much more slowly there, in comparison to the situation in central and northern Europe (*cf. e.g.* Möller Wiering in this volume). In contrast to the contemporary Swiss finds (*cf.* Médard, Rast-Eicher in this volume), even textiles of the Neolithic and Bronze Age periods, which have been recovered in northern Italy since the nineteenth century, have received very little attention over the preceding decades. In fact, the 2002 exhibition at Riva del Garda brought together for the very first time a number of such Bronze Age fragments (Bazzanella *et al.* 2003); they are by far the best published archaeological textiles found in Italy (Bazzanella and Mayr 2009; *cf.* Bazzanella in this volume).

Several attempts to study Pre-Roman archaeological textiles in Italy were made over the course of the 20th century. In 1921, A. Lenticchia was the first to examine textiles under the microscope, while, a year later, G. Baserga published one of the earliest analyses of Italian archaeological textiles (Baserga 1922). After a considerable gap in time, a number of articles on the Molina di Ledro material were published in the early 1970s (*e.g.* Perini 1970). It was not until the 1980s and the 1990s, however, that scientific publications of archaeological textiles started to appear on a more regular basis. The first summary of the evidence for the Etruscan period was made by Jeanine Stage in 1991 in a catalogue, which included 35 sites/fragments (Stage 1991). Johanna Banck Burgess (1999) included many of the same finds in her catalogue. Material from a few sites has been published individually, as, for example, over a hundred fragments recovered from a Late Villanovan boat burial at Sasso di Furbara (Masurel 1982; Mamez and Masurel 1992). The spectacular finds

from Verucchio have added significantly to our knowledge of ancient Italian textile technology. This site boasts of the only almost complete Italian Iron Age garments. The publication of material from one of the Verucchio tombs is already an indispensable source of information for anyone interested in Etruscan textiles and garments, and investigations of material from other burials are in progress (Stauffer 2002 and in this volume; Raeder Knudsen 2002 and in this volume). Other recent discoveries, such as the articles of clothing found frozen at Vedretta di Ries in the Alps (Dal Ri 1996; Bazzanella *et al.* 2005), have also added significantly to our knowledge of the textiles of ancient Italy.

The famed Iceman discovered frozen in the Alpine glacier in 1991 had a complete wardrobe, giving an opportunity for the most sophisticated analysis of the material (Winiger 1995; also see Bazzanella in this volume). Although the mummy's garments were made of skin, leather and grass and not textiles, they provided invaluable information about the way people dressed during the Chalcolithic period.

The vast majority of Italian archaeological textiles, however, survive as minute traces on metal objects, such as fibulae and vessels. Until recently, the only such object that had been studied extensively was a bronze bowl, believed to have originated at Veio, and now in the Newark Museum, USA (Carroll 1973). In the latest publications, more attention is being paid to such textile traces (*e.g.* Gandolfo 1981; Buranelli 1983, 129; Terranova and Lo Campo 1999). Given the dearth of archaeological textile finds in Italy, the examination of these remains is invaluable for a better understanding of ancient Italian textile technology.

The present author has compiled a catalogue of published archaeological textiles in Italy dated to the pre-Roman period, which was published together with an extensive study on textile tools and their various contexts (Gleba 2008a). Etruscan clothing depicted on figurines, statues, vases and tomb paintings has been investigated by Larissa Bonfante in her still unsurpassed *Etruscan Dress* (2003 edition of 1975), as well as in her numerous articles.

Raw Materials

In prehistoric times in Italy, both plant and animal fibres were used for making textiles. The principal plant fibre was flax. Tree fibres were

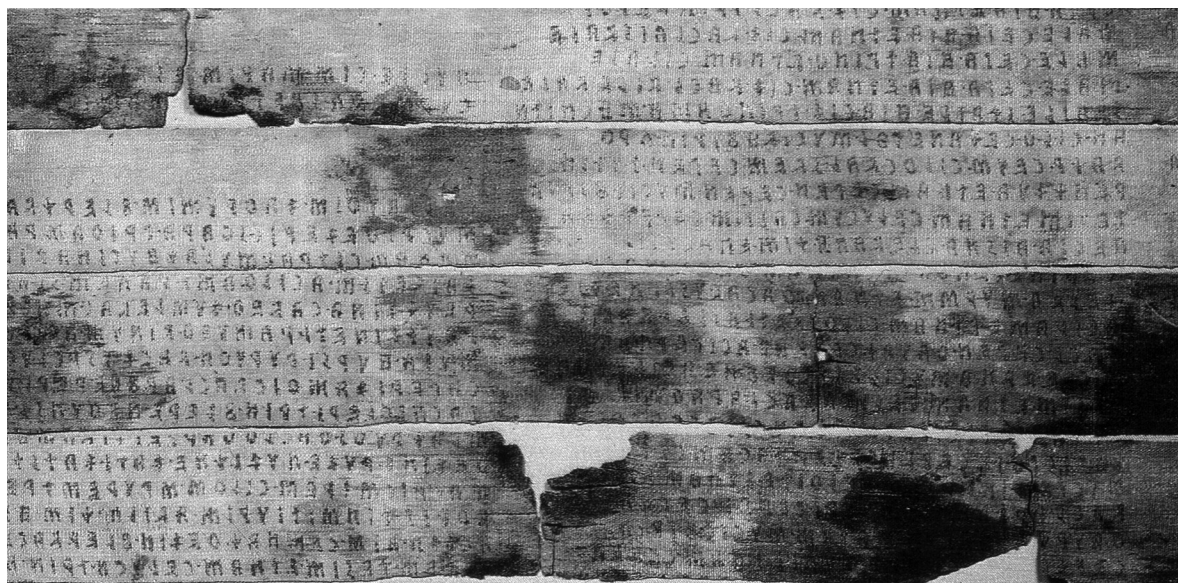


Fig. 9.2. *Liber linteus zagabriensis*, 3rd–2nd century BC (© Zagreb Archaeological Museum).

common in the prehistoric period (Körber-Grohne 1991, 98–101), and Antoinette Rast-Eicher (2005, 119) even coined the term ‘bast-culture’ for Neolithic Europe. A bunch of carbonised lime/linden fibres wound in a ring is documented at Early Bronze Age Molina di Ledro (Bazzanella *et al.* 2003, 174; and in this volume). Tree bast was used in the textiles from the Early–Middle Bronze Age Valle delle Paiole (Bazzanella *et al.* 2003, 198). Various grasses were also in use. The most famous find is the mantle or mat of the Iceman Ötzi, made of twined grass (Winiger 1995; *cf.* Bazzanella in this volume). The earliest evidence for hemp in Italy consists of a textile identified on a metal object found in an Early Bronze Age burial at Gricignano d’Aversa, Caserta (*cf.* Bazzanella in this volume). Another securely identified hemp find is a small textile fragment from a 5th-century BC infant burial in Himera, Sicily (Di Sclafani *et al.* 2005). Cotton arrived in Europe and Italy only during the Roman period (Barber 1991, 32).

The major animal fibre was sheep wool, with occasional use of goat hair and other, more unusual fibres, such as horsehair. Perfectly preserved Early Iron Age wool garments have been found in the Alpine glacier of Vedretta di Ries (Dal Rì 1996; Bazzanella *et al.* 2003, 179–182; Bazzanella *et al.* 2005; Rottoli 2005, 73).

The other important animal fibre, silk, did not appear in Italy until Roman times (*cf.* Bank-Burgess, Möller-Wiering in this volume). An unusual animal fibre, byssus or sea-silk, derived

from the secretion of the mollusc, *Pinna nobilis* L., was also used in antiquity, although presently there is no direct evidence for its use before the late Roman period (Maeder 2002; Maeder *et al.* 2004). One last, unusual, textile fibre should be mentioned, asbestos (Pionati Shams 1987, 3–11). It is derived from a mineral amphibole and has a unique quality of withstanding extremely high temperatures, a trait that was noticed and used in antiquity.

This variety of fibres reflects not only the availability of raw materials – whether locally or through exchange – but also the knowledge of technologies to convert them from their raw state to usable fibre.

Linen

Due to the scarcity of archaeological evidence for linen use and production in the 1st millennium BC Italy, until recently the commonly held view was that linen had to be imported to the Apennine Peninsula from other flax-producing regions of the Mediterranean (*e.g.* Bonfante 2003, 11). Egypt often has been assumed as the area of origin for linen found in Italy (Carroll 1973). The number and wide chronological and geographical distribution of surviving linen fragments, and especially Neolithic and Bronze Age evidence from north Italy (*cf.* Bazzanella in this volume), however, seem to indicate indigenous production. The suggestion was made already by Carroll (1973) based on the analysis of a mineralised linen fragment adhering to a 6th-century BC bronze bowl possibly from Veio, now in the Newark

Museum, USA. She argued that the piece was an Etruscan product since both sets of thread were z-twisted, typical of European rather than Egyptian technology. The few other Italian textile fragments securely identified as linen are all z-twisted. In fact, archaeological, historical, and artistic evidence suggest that linen was used and produced in Italy long before the Roman period (Gleba 2004).

Flax appeared in Italy during the Neolithic period and, in some areas, may have been the dominant textile fibre (Rast-Eicher 2005). Yet, while scholarly works abound on the economy of wool production in Italy, linen is barely mentioned in archaeological and historical literature, if at all. The notable exception is a recent study of Roman textile production in Italy by Vicari (2001), who examines historic and epigraphic evidence for both wool and linen.

The oldest find of flax in Italy, consisting of one seed only, comes from Sammardenchia (Udine), the site dated from the middle of the 7th to the middle of the 6th millennium BC (Rottoli 1999; Rottoli 2003, 68). Seeds and a few seed capsules have been found in the submerged 6th-millennium BC settlement of La Marmotta in Lake Bracciano (Rottoli 1993, 310). More numerous finds of linseed come from the Late Neolithic sites Lagozza, Isolino di Varese and Settefonti (Renfrew 1973, 122). Late Neolithic levels at Palù di Livenza yielded hundreds of flax seeds and capsule fragments, as well as seeds of the herbaceous plant flaxfield catchfly (*Silene linicola*), which is a characteristic weed species of flax crops (Rottoli 2003, 68). Later still, flax is attested among the crops of Bronze Age North Italy, the region that would be praised by Pliny the Elder for producing some of the best linens of the Roman world. The sites include Fivè and Volano San Rocco in Trentino, Lazise and Valeggio sul Mincio in the Lake Garda area, and Castellaro del Vhò in the province of Cremona (De Marinis 1988, 22). In the 1st millennium BC, *Linum usitatissimum* L. is attested in the 8th-century BC site Palse, the 5th-century BC settlements Casale di Rivalta and Montereale Valcellina, and at the slightly later site of Monte Bibele, all located in the Po valley – again the region famous for its linens in later times (*Protostoria tra Sile e Tagliamento* 1996, 465; Bertani 1995, 42). In the south of the peninsula, the evidence is limited to only

one site, Pratola Serra (Avellino), which yielded linseed (Rottoli 2003, 68).

That linseed was not only related to food/oil production is substantiated by linen textile fragments recovered from various archaeological sites in Italy. The oldest linen textile in Italy, and indeed in Europe, comes from the submerged Neolithic settlement of La Marmotta in Lake Bracciano, and has been radiocarbon dated to 5480–5260 BC (*cf.* Bazzanella in this volume). A large number of linen textiles have been found in the *terremare* in North Italy dated to the 3rd and early 2nd millennium BC (Rast-Eicher 1997). Well-known are the plain- and pattern-woven linen cloths from the lake-dwelling Molina di Ledro (Bazzanella and Mayr 2009; *cf.* Bazzanella in this volume), where balls of flax thread were also preserved, attesting not just textile use but also textile production.

Unlike the prehistoric settlement material, the 1st-millennium BC evidence of flax derives predominantly from funerary contexts. For example, textile fragments, identified as linen, were found in the 7th-century BC Tombs A and G at Etruscan Casale Marittimo (Fig. 9.1; Esposito 1999, 41 fig. 31, 68–69 fig. 65, 71 fig. 67, 93–94). Some of these were wrapped around weapons or contained cremated bones. In another case, in the Tomba del Duce at Vetulonia, dated to the second half of the 8th century BC, a plain-woven linen cloth was found inside a larnax that also contained cremated bones (Falchi 1887, 506; von Duhn 1924, 239; Camporeale 1967, 141; Banck-Burgess 1999, 232; Torelli 2000, 582 no. 130). In fact, textile fragments described as linen are frequently mentioned in excavation reports as remains of the wrapping material for various objects. Regrettably, very few of these have been analysed scientifically, the identification often being based on general observation.

Of undoubted importance is the famous *liber linteus Zagabiensis* (Fig. 9.2), Etruscan linen book dated to the 3rd–2nd centuries BC (Krall 1892; Roncalli 1980; *Liber Linteus Zagabiensis* 1986; Flury-Lemberg 1986; 1988, 344–357, 496; van der Meer 2007). It is the longest surviving Etruscan inscription and, as the only existing fragment of a linen book, it is one of the most important pieces for the textile history of Italy, reflecting the significance of linen as a ritual material. Production of cloth for the sacred books must have been strictly controlled and hence most likely local. Furthermore, given

the vagaries of sea transport at the time, it would hardly have been prudent to rely on long-distance imports.

In addition to the archaeological evidence, a great deal of information confirming the widespread use of linen in ancient Italy can be obtained from other sources. Indirect evidence for the existence of linen garments comes from the later artistic representations. The 'transparent' white dress with fine folds rendered in the 6th to 5th-century BC Etruscan tomb paintings of Tarquinia is assumed to be an artistic convention for thin linen cloth (Bonfante 2003, 12). Wool, on the other hand, is usually shown with checked patterns.

Although later than the period of our interest, literary sources describe events and practices that certainly harked back to earlier times. It is suggestive that linen is seldom mentioned in texts, indicating that its use was taken for granted, except in unusual cases. Pliny the Elder is the author who has left us by far the largest amount of written information about linen in antiquity. In the *Naturalis Historia*, he described in detail not only the various uses of linen but also how and where it was produced in the 1st century AD. Thus, he claims that the best linen of his day, came from Saetabis in Spain (Plin. *NH* 19.9; cf. Sil. *Pun.* 3.377; Grat. Fal. *Cyn.* 41; cf. Alfaro in this volume). The second and third places in quality, however, are given to the linens of North Italy (Plin. *NH* 19.9).

Pliny the Elder (*NH* 19.9) mentions that the Alia district of Italy between the Po and the Ticino produced linen which was the third best in Europe, while the second prize was won by the linens of Retovium near the Alia district and Faventia on the Aemilium road. Archaeobotanical and epigraphic evidence (Vicari 2001; Gleba 2004) also point to Lombardy and the Po valley as the main linen-producing regions not only in Roman times, but long before as well.

Another important region of linen production was located in Latium and Campania. As mentioned earlier, the south also seems to have had a flax-growing tradition going back to the prehistoric period, albeit the evidence is scarcer than in north Italy. By the middle of the 1st millennium BC, the area of Tarquinia was famous for its flax, and linen cloth was considered characteristic dress for Faliscans during the 3rd century BC (Sil. *Pun.* 4. 223

and Grat. Fal. *Cyn.* 40). Flax cultivated in the nearby Paelignian territory was praised for its whiteness (Plin. *NH* 19.13). Also, according to Livy, in the war of 308 BC, Samnite troops wore white linen tunics (9.40) and slept under linen tents (10.83), indicating that a relatively large supply of the material was available.

Flax cultivation required considerable organisation and planning, especially for large quantities, as in the case of sail production or army supplies. Furthermore, the preparation of the raw material for spinning is rather time- and labour-consuming (McCorriston 1997). Only after a long process can the fibre be spun and the final product, the linen cloth, woven. Ultimately, the quality and cost of linen was affected by the climatic conditions in the region and the annual weather changes.

Wool

The second major type of textile fibre in antiquity was wool (Forbes 1956, 2–27; Barber 1991, 20–30). As early as the beginning of the 5th millennium BC, when the first evidence for farming in Italy appears, sheep are among the most important domestic animals (Barker 1975, 46). In the 3rd millennium BC, the mortality data of faunal samples indicate the increasing importance of secondary animal products (Barker 1976, 301; Barker and Rasmussen 1998, 50; Rast-Eicher 2005, 127). The evidence consists of slaughter patterns, which indicate the predominance of adult animals in the flock. Furthermore, according to this evidence, an important change in animal husbandry practices took place in Central Italy during the Middle and Late Bronze Ages, with a clear increase in sheep and goat numbers (De Grossi Mazzorin 2004, 38). By the Early Iron Age, generalised stock-keeping had been replaced by a more intensive system, with stocks consisting mostly of sheep and goats, and with a distinct emphasis on wool production (De Grossi Mazzorin 2004, 39). A wider range of domestic resources and more specialised butchery systems were developed (Barker 1988, 782; Barker and Rasmussen 1998, 185). Various sites began to specialise. Thus, in Central Italy, Cerveteri seems to have been producing wool, while in Populonia, sheep were kept to supply the town with meat (Barker and Rasmussen 1998, 186). Smaller sites and farms had a less specialised sheep husbandry producing all necessary subsistence products like meat, milk and wool.

Although the evidence for sheep husbandry and wool production is much more abundant than remains of flax cultivation, well-collected faunal assemblages are still rare on Italic sites. Not only the identification of species, but also more information about slaughter patterns, with age/sex distributions, is needed in order to draw further conclusions about wool flocks. This information, however, is often difficult to ascertain due to limitations of archaeological samples (Barber 1991, 28). The few available samples derive from large sites rather than from farms and often reflect patterns of urban consumption (Barker 1988, 782).

Animal transhumance has been a fundamental element of the Italian economy since sheep husbandry began and the minimal change over time reflects the success of this original strategy (Barker 1976, 6, 304; Frayn 1984; MacKinnon 2004). Large-scale transhumance was generally practised over long distances, while small-scale animal movement was restricted to smaller areas. It was the large-scale transhumance that was “likely geared towards the production of wool with more animals reared to adulthood” (MacKinnon 2004, 56). Numerous transhumance routes existed from ancient times until quite recently, especially in the south (MacKinnon 2004) but also in the north of Italy (Bonetto 2004). Thus, textiles were not necessarily produced where the raw material was procured, and wool and even sheep were often moved over large distances (Bonetto and Ghiotto 2004, 53).

The advantage of sheep herding over flax cultivation is that wool, as a fibre, does not require prime agricultural land; in fact, non-agricultural areas can be utilised as pastures. Wool does not require ploughing, sowing, weeding, or harvesting, and it is less affected by weather conditions. Fewer herders are needed to tend the flock in order to produce a greater volume of fibre than would be generated by the same people cultivating flax. The agricultural labour, which would have been necessary for flax growing, could therefore be diverted to other tasks. Furthermore, the preparation of wool fibres for spinning is a relatively less time-consuming technology than the numerous stages of post-harvest flax processing (Barber 1991, 20–21).

Pliny the Elder (*NH* 8, 187–199) provides a very detailed description of sheep husbandry in his time. According to him (*NH* 8, 190), the

most valued wool came from Apulia, although it was of short hair and was best suited for cloaks. Tarentine and Canosine wools in particular were regarded as some of the best and were exported raw (Plin. *NH* 8, 190–191; Morel 1978, 108). The second best was the wool of a Greek breed, also called Italian, and the third place was held by sheep of Miletos in Asia Minor. The fleece most valued for its whiteness and fineness came from Gallic races of sheep from the Po valley (Plin. *NH* 8, 190–191; Columella *Rust.* VII.2). It is clear from Pliny’s descriptions that specific breeds of sheep, differing in the colour, length and thickness of their fleece, were established in different areas by the 1st century AD (Plin. *NH* 8, 189–193). While little work has been done to date in differentiating ancient Italian sheep breeds archaeologically, some possibilities have been noted. Thus, the analysis of bones from the Picene sites of Ancona, Osimo and Moie di Polenza has shown the presence of a variety of goat and at least two breeds of sheep, one of which is distinguished from the other by the absence of horns in female animals (Wilkins 1992, 42).

The earliest actual find of wool documented in Italy comes from Molina di Ledro and is dated to the Early Bronze Age: it consists of some sewing threads used in a linen belt (Bazzanella *et al.* 2003, 162). The earliest textile fragment of pure wool comes from a Middle Bronze Age *terramara* of Castione dei Marchesi (*cf.* Bazzanella in this volume). There are, however, numerous wool textiles surviving from the Iron Age. The most complete items have been recovered at the 8th-century BC site of Verucchio (*cf.* Stauffer in this volume). A large assemblage has also been found at the slightly earlier boat burial at Sasso di Furbara (Masarel 1982; Mamez and Masarel 1992; Barber 1991, 194; Banck-Burgess 1999, 43, 231). Unlike the 1st-millennium BC linens, which were primarily plain-woven, all of these textiles have complex weaves and patterns.

The wool from Castione dei Marchesi has been analysed for its quality. It has fine underwool and very thick hairs, a distribution typical of Bronze Age wool in other areas of Europe (Rast-Eicher 2005, 127 and in this volume). Further work is much needed in this direction to ascertain the possible chronological developments of wool fibre in Italy, which may help differentiate sheep breeds. Iron Age wool samples are currently undergoing wool quality analysis.

Site/object	Fibre	Weave	Warp twist	Warp D (mm)	Warp count (thr/cm)	Weft twist	Weft D (mm)	Weft count (thr/cm)
<i>Verucchio</i>								
Mantle 1	wool	2/2 twill	z, s	—	12–14	z, s	—	24
Mantle 2	wool	2/2 twill	z, s	—	12–16	z, s	—	22–26
Garment	wool	2/2 twill	z, s	—	14–16	z, s	—	19–20
T1	wool	tabby	z	—	4–6	z	—	4–6
T2	wool	2/1 twill	z, s	—	10–12	z, s	—	18
T3	wool	2/2 twill	z, s	—	20	z, s	—	20
T4	wool	tabby	z	—	18–20	z	—	30–32
T5	wool	2/2 twill	z, s	—	22–24	z, s	—	20–24
T6	wool	2/2 twill	z, s	—	12–18	z, s	—	12–18
T7	wool	2/2 twill	z, s	—	16–20	z, s	—	16–20
T8	wool	2/2 twill	z, s	—	20–26	z, s	—	20–26
T9	wool	tabby	z	—	6	z	—	6
T10	wool	2/2 twill	z, s	—	16	z, s	—	26
<i>Sasso di Furbara</i>								
Group 1	wool	chevron twill	z, s	0.2	35–45	z, s	0.1–0.2	35–40
Group 2	wool	tabby	S2z	0.3–0.4	7–8	z	0.2	35–40
Group 3	wool	tabby	S2z	0.6–0.8	6–7	z	0.6–0.7	17–20
Group 4	wool	tabby	z	1.5	3	s	0.8–0.9	18
Group 5	wool	tabby	z	0.4–0.6	8	z	0.5–0.6	25–30
Group 6	wool	tabby	Z2s	0.7	7–8	z	0.3	32
Group 7	wool	twill	z, s	—	—	z, s	—	—
<i>Vedretta di Ries</i>								
Under-leggings	wool	tabby	s	—	18	s	—	8
Over-leggings	wool	chevron twill	Z2s	—	8	s	—	14
Patch	wool	tabby	z	—	9	z	—	6
Inner shoes	wool	2/2 twill	z	—	12	s	—	8
Patch	wool	2/2 twill	z	—	10	z	—	8
Patches	wool	2/2 twill	z	—	6	z	—	6
<i>Monte Bibele</i>	wool							
<i>Perugia?</i>	flax	warp-faced tabby	z	—	23	z	—	12
<i>Cogion-Coste di Manone</i>	wool	weft-faced tabby	s	—	10	s	—	60
<i>Borgo le Ferriere</i>	—	weft-faced tabby	z	—	11	z	—	60–80
<i>Orvieto?</i>	—	tabby	z	—	15–16	z	—	15–16
<i>Himera</i>	hemp	tabby	z	—		z	—	
<i>Newark</i>	flax	weft-faced tabby?	z	—	6–8	z	—	16
<i>Chiusi</i>	wool	weft-faced tabby	—	—	35	z	—	60
<i>Este</i> n. 105	— —	tabby tabby	z z	0.5 0.3	20–25 15–20	z z	0.5 0.3	20–25 15–20
<i>Tarquinia</i>	—	diamond twill	S2z	0.5	18	s	0.3	14
<i>San Basilio</i>	—	2/2 twill	z	0.4	16	s	0.3	20
<i>Unknown</i>	asbestos?	tabby	s	1–2	5–6	s	1–2	4

Dyes

While little information is available at present regarding original dyes and colours of ancient Italian textiles, some indication is provided

by artistic representations. Tomb paintings of Etruria and Campania are useful in particular: garments and utilitarian textiles are resplendent in reds, blues, greens, yellows and purples.

Table 9.1. Technical characteristics of Iron Age textiles from Italy.



Fig. 9.3. Textiles from Vedretta di Ries: over-legging (top left), under-legging (top right), inner shoe (bottom), 795–499 BC (After Bazzanella et al. 2003, 180–182).

Care must be taken in not over-interpreting this information since, certainly, the colour schemes were highly dependent on the availability of the pigments to the artists and artistic conventions. Nevertheless, certain tendencies are evident: tunics are generally shown in lighter tones, while cloaks are depicted in darker colours. The decorative elements such as borders are often red.

The studies of dyes in ancient Italy have been limited by the rare survival of actual textiles and the often badly degraded state of their colour. Information about ancient mordants is even scarcer than our knowledge of ancient dyes.

The most extensive dye analyses of Italian pre-Roman material have been performed on the Villanovan Verucchio textiles (Vanden Berghe 2002, 220; Stauffer 2004 and in this

volume). These results are of great importance, since they indicate the use of complex dyeing technologies and a variety of dyes in the Early Iron Age. Thus, Verucchio Mantle 1 was dyed with madder, while the fibres of its purple border were most likely treated with madder and woad (*cf.* Stauffer in this volume). Mantle 2, on the other hand, was found to contain purpurin and luteotin in the base textile, indicating the use of a variety of madder and a yellow dye, while its border was also dyed with woad, creating a purple-red effect. Other textiles contained purpurin, suggesting the use of madder, and indigotin, indicating woad. This preliminary analysis demonstrates that several different dyes were used to add colour to the Verucchio textiles, while their combination in some textiles shows an understanding of a complex, multiple-stage dyeing process. Indigotin has also been identified in the sewing thread of the shoe from Vedretta di Ries (Dal Ri 1996, 375; Bazzanella et al. 2005, 158). The colour blue was observed on some threads of a textile from Chiusi (Hero Granger-Taylor, pers. comm. 2002).

None of the extant pre-Roman textile fragments found in Italy have tested positive for Tyrian purple so far. However, other archaeological evidence as well as literary sources attest its production on the Apennine Peninsula. The earliest evidence for purple extraction in Italy comes from Coppa Nevigata in South Italy, where a large accumulation of *Haraplex trunculus* was found already in the Early Proto-Apennine layers, with highest numbers in the Apennine and Late Apennine periods, represented by tens of thousands of mollusc remains (Cazzella et al. 2005; Reese 2005, 111). Later evidence comes from two sites situated at the opposite ends of the Italian Peninsula: Broglio di Trebisacce in northern Calabria and Frattesina in Veneto (Renato Peroni, pers. comm. 2003). All three sites had connections with the Aegean in the Bronze Age, and it is possible that the technology was brought to Italy by the Mycenaeans.

More definitive evidence indicating purple production in Italy is recorded a few centuries later. Several centres of purple production have been identified in Italy and Sicily on the basis of archaeological and literary evidence: Ancona, Monte Circeo, Pozzuoli, Canosa, Taranto, Siracusa, Marsala, Segesta and Mozia (Forbes 1956, 136, 162; Morel 1978, 104; De Juliis 2000,

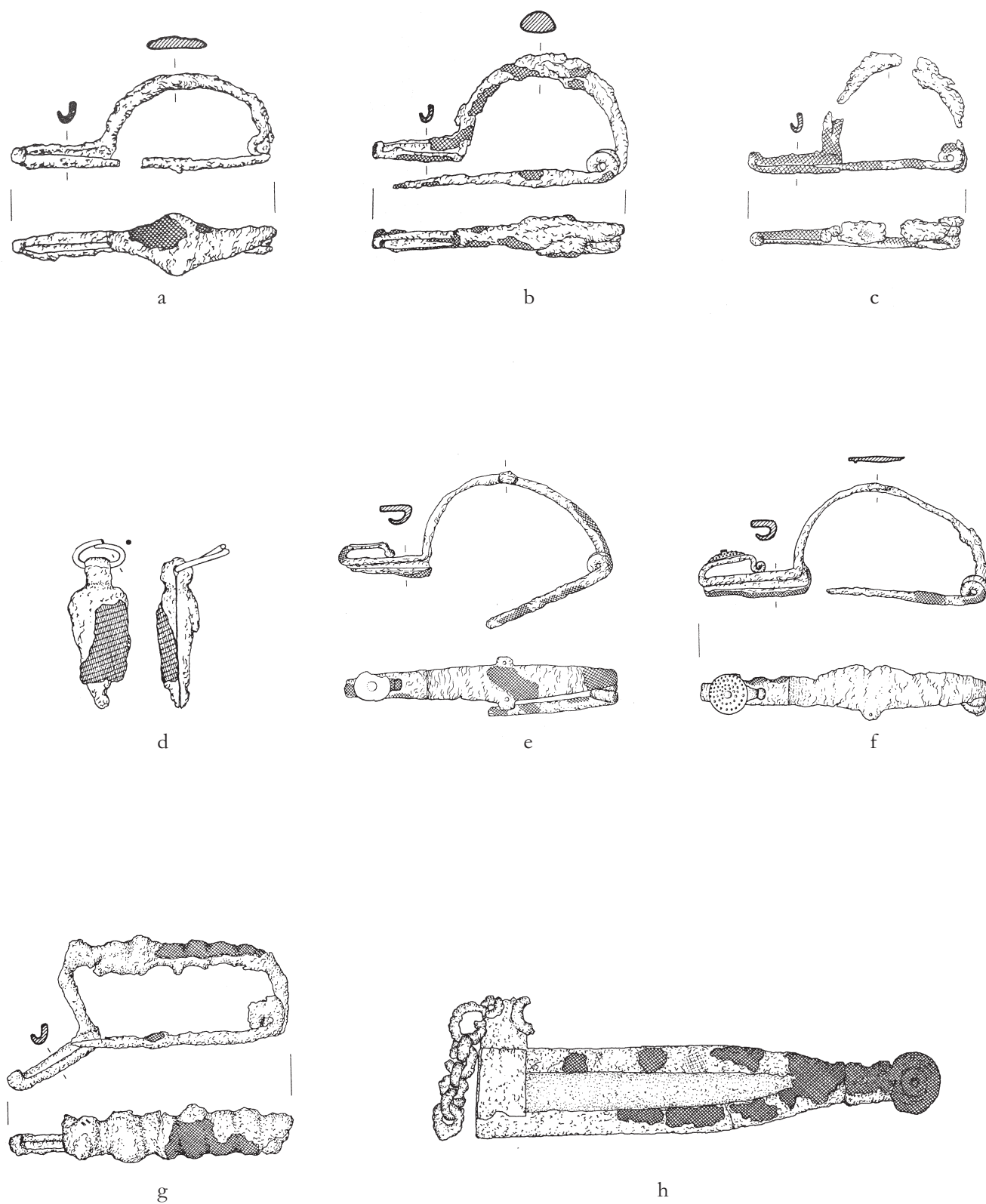


Fig. 9.4. Iron objects with pseudomorphs from Alfedena, 7th–6th century BC: a) Tomb 85; b–c) Tomb 78; d–f) Tomb 70; g) Tomb 104; h) Tomb 102 (After Parise Badoni and Ruggeri Giove 1980, Pl. 29 no. 1; Pl. 78 nos 1, 7; Pl. 20 nos 1, 4, 6; Pl. 39 no. 2; Pl. 38 no. 2).

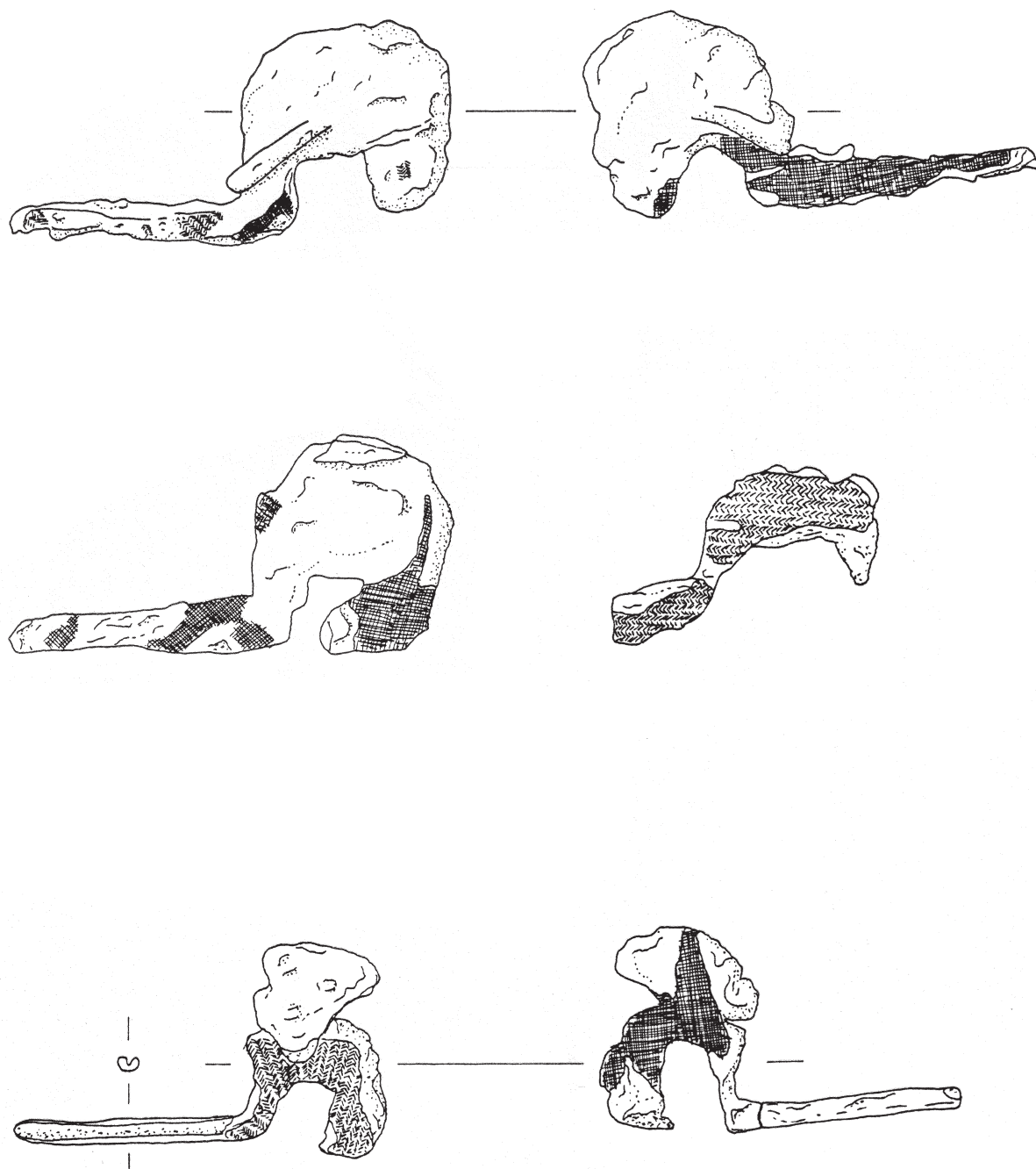


Fig. 9.5. Textile traces on fibulae from Tombs LIX and XLIV, Tarquinia Le Rose, early 7th century BC; top and bottom drawings show two sides of the same fibulae, preserving different textiles (After Buranelli 1983, Fig. 102).

81; Macheboeuf 2004; Reese 2005, 111). In Mozia, significant accumulations of crushed *Murex* shells were found in 6th to 5th-century BC layers (Mozia 1989, 40; Reese 2005). In Taranto and Marsala, purple production can be dated back to at least the 5th–4th centuries BC, attested by coins with murex depictions from both sites (Macheboeuf 2004, 28–29). Textual sources and mounds of crushed shells documented in the 19th century AD indicate that Taranto was probably the most important

purple production centre in Italy. During the Roman period, several purple merchants (*purpurarii*) were established in North Italy, attested by the inscriptions from Parma, Faenza (Faventia), Mevaniola, Piacenza (Placentia), and Aquileia (Macheboeuf 2004, 29–33). The latter site also produced thousands of crushed muricid shells.

The precious purple and golden textiles have been famous since at least the Hellenistic period (cf. Spantidaki and Moulherat in this volume).

It may thus be possible to trace the no longer existing purple through its golden counterpart. Gold threads were made of flat gold strips or very thin strips of gold wound around a textile fibre core. Because of the material, the resulting gold thread was especially costly. It is unclear how early the practice began in Italy, but Pliny the Elder (*NH* 19.57) quotes Verrius Flaccus who recounts that the Roman king, Tarquinius Priscus (traditional dates 616–578 BC) celebrated a triumph wearing a golden tunic. The earliest archaeological finds, however, date to the 4th century BC. The conservation of the Tomba François at Vulci yielded the remains of thin gold strips, which originally were integrated into a textile, possibly a cloak not unlike the one worn by Vel Sathies in the fresco in the same tomb (Moretti Sgubini 2004, 23, 28 fig. 12). At Canosa, in the contemporaneous Tomba degli Ori, fine gold strips were found inserted into a textile (Duhn and Messerschmidt 1939, 315; De Juliis 1984, 329–330, 339 no. 277, 447–448 CXX nos. 24–26; Banck-Burgess 1999, 229). In several 2nd to 1st-century BC tombs at Taranto (De Juliis 1984, 330, 339–340 no. 278, 464 CXXX no. 5), strips of gold weft have been recovered that may once have been garment fringes. Apart from another find from a 3rd-century BC tomb in Civita Castellana, the rest of the textiles containing gold thread in Italy date to the Roman period (Gleba 2008b).

The production of gold thread must have been specialised and limited to a few places. The possibility has been suggested that ancient Taras/Tarentum may have been an Italian production centre for gold thread and textiles in Hellenistic times (De Juliis 1984, 331). This is not unlikely, given the early date for many of the finds and the fame of Tarentum as a centre for gold crafts. Furthermore, the Tarentine purple industry would have provided the resource needed for the production of gold and purple textiles.

Textile Technology

By the Bronze Age, sophisticated technologies were being utilised by ancient inhabitants of the Apennine Peninsula for textile production and, by the Early Iron Age, Italic populations were familiar with diverse fibres, dyes and weaving techniques. The catalogue of archaeological textiles of Italy published to date includes over

70 sites (Gleba 2008a). Despite the fact that the majority of textiles listed in the catalogue have not been analysed scientifically, some preliminary observations can be drawn on the basis of the available corpus of material.

While plied yarn is characteristic for the Bronze Age (*cf.* Bazzanella in this volume),

Fig. 9.6. Traces of a rectangular shroud in Tomb 3 at Osteria dell'Osa, 9th century BC (After Bietti Sestieri 1992, Fig. 3a.391).

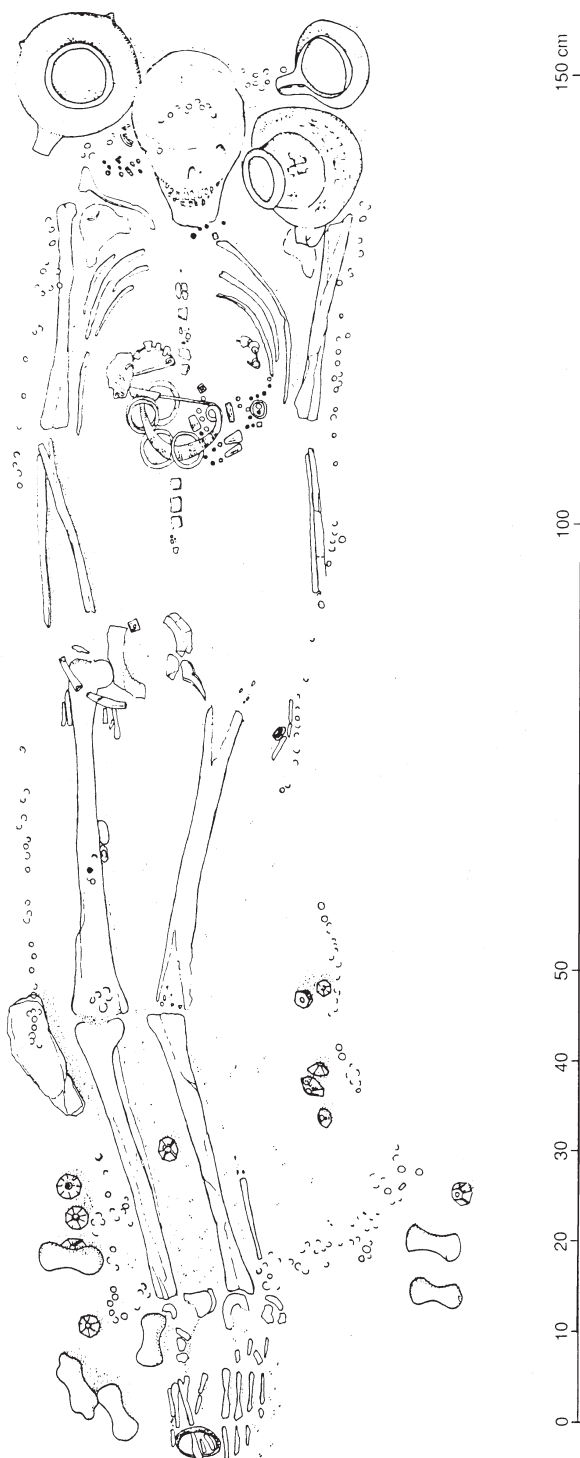


Fig. 9.7. Reconstruction of the deposition of cremated remains wrapped in cloth (After Bianchin Cifton et al. 1998, 92 Fig. 39).

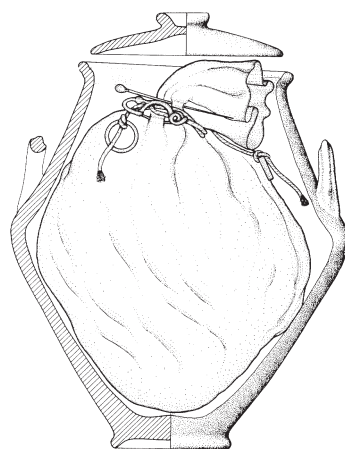
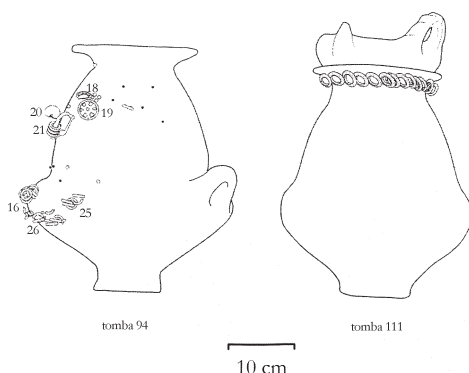


Fig. 9.8. Urns from Tombs 94 and 111 at Tarquinia, Villa Bruschi Falgari, with fibulae positioned around, indicating the original presence of textiles (After Trucco 2006, 97 Fig. 1B).



single yarns are most common during the 1st millennium BC, as can be observed from the available data, collected in Table 9.1. Z-twist seems to be prevalent throughout all periods but it is not exclusive. The yarn in the wool fragment from Bronze Age Castione Marchesi (cf. Bazzanella in this volume) s-twisted, in contrast to the S2z twist of the contemporary linen textiles. Lise Bender Jørgensen (1992, 118) sees this as an indication of a new technology being developed for wool fibre. The evidence is, however, too limited at present to draw any further conclusions.

During the Early Iron Age, there is a clear tendency to combine yarns of opposite twists to create spin-patterned textiles, such as those of Verucchio and Sasso di Furbara (cf. Stauffer, Grömer in this volume). The reason for this preference may be aesthetic; however, it also reflects the knowledge of the technique and appreciation of the subtlety of spin patterning.

Another observation, albeit based on a very few examples, is that Bronze Age wool yarns are significantly thicker than the yarns of the early linen textiles. This tendency can also be

observed in contemporary Scandinavia, where the more abundant wool textiles also have thicker yarns than the few plant fibre finds (cf. Mannering *et al.* in this volume). The question must remain as to whether this phenomenon reflects the different techniques developed for different fibres, or the preference and tastes of the Bronze Age populations.

The thread counts in textiles from Pre-Roman Italian sites are relatively high (Table 9.1). The thread counts are more uniform among the Bronze Age textiles, ranging from 10 to 20 and the textiles are relatively balanced. Later periods show more variation in thread count and balance, with many weft-faced tabbies. The majority of the Bronze Age textiles have thread counts above 10 threads/cm, with the exception of wool textile from Castione dei Marchesi (cf. Bazzanella in this volume). During the Early Iron Age, the thread counts rise to 30–40 with even higher numbers in subsequent periods.

A variety of techniques were used to create textiles, including loom weaving, tablet weaving, soumak and some type of twining. The weaves made on a loom include tabby and a variety of twills. Tabbies, characterised by plied yarn in one or both systems and defined by Bender-Jørgensen (1992, 122) as the ‘Döhren type’, are typical for the Neolithic/Bronze Age Italian finds. They are also common in central Europe, where they are present from the Neolithic and the Bronze Age through the Iron Age (Bender Jørgensen 1992, 117). Plain linen z/z tabby seems to be prevalent in Italy during the Iron Age, just as in the eastern part of central Europe (Bender Jørgensen 1992, 125). Many of the tabbies are not balanced and especially weft-faced tabbies are common.

Although regarded as an Iron Age feature of textile technology, twill developed during the Bronze Age (Rast-Eicher 2005, 128; cf. Grömer in this volume). By the Early Iron Age, complex twills were ubiquitous throughout Europe. The sophistication of twills from Verucchio, Sasso di Furbara and Tarquinia indicate a well-established and settled technology. Prominent among the twills, is Bender-Jørgensen’s (1992, 122) ‘Vače type’, a spin-patterned twill in single yarn. This technique, encountered in the Hallstatt textiles (Grömer 2005, 23 and in this volume), is probably illustrated in the numerous Etruscan iconographic sources representing a variety of plaids, diagonals, chevrons, diamonds and elaborate borders, and to a certain extent,

is one of the defining features of Etruscan textiles. The diagonal twill, observed among the Vedretta di Ries and Sasso di Furbara textiles, is common among the textiles found in the salt mines of Hallstatt and Dürrenberg in Austria (*cf.* Grömer in this volume). Diamond twill is also present among the Early Iron Age finds from Verucchio and Tarquinia.

Borders woven in complex tablet technique are found on textiles from Verucchio and Sasso di Furbara. Such borders are well represented in central Europe, for example in Hallstatt, Austria (*cf.* Grömer in this volume) and Hochdorf and Hohmichele, Germany (*cf.* Banck Burgess in this volume). The textiles of Verucchio have been demonstrated to be ceremonial garments and their tablet-woven borders appear to be status markers with not only their presence but also their width bearing significance (Stauffer 2002 and in this volume; Raeder Knudsen 2002 and in this volume). The specifics of spool presence in Early Iron Age burials of Italy and the ubiquitous presence of borders in Etruscan garment representations further argue that these borders were not purely decorative, but communicated a very clear and important message of status both among the Etruscans as well as among other European Early Iron Age cultures (Gleba 2009).

Finally, evidence for sewing should be considered. Although ancient Italy is commonly regarded as the area of the 'off-the-loom' or 'woven to shape' textiles (Granger-Taylor 1982), many finds indicate that the sewing needle was in use for both structural and decorative purposes. Some of the finds have seams and hems, while others have mends and patches sewn onto them (Bazzanella *et al.* 2005). Sewing is also prominent among the textiles from Hallstatt (*cf.* Grömer in this volume). Applied decoration has been used in Italian textiles since at least the Bronze Age and could consist of seeds, glass beads, amber or metal attachments.

Textile Function

The vast majority of surviving textiles come from burial contexts, thus demonstrating that they constituted a very important part of broader mortuary practices. The Vedretta di Ries finds present the only exception. Their owner died, probably in an avalanche, while attempting to cross the Alps (Dal Ri 1996, 385).

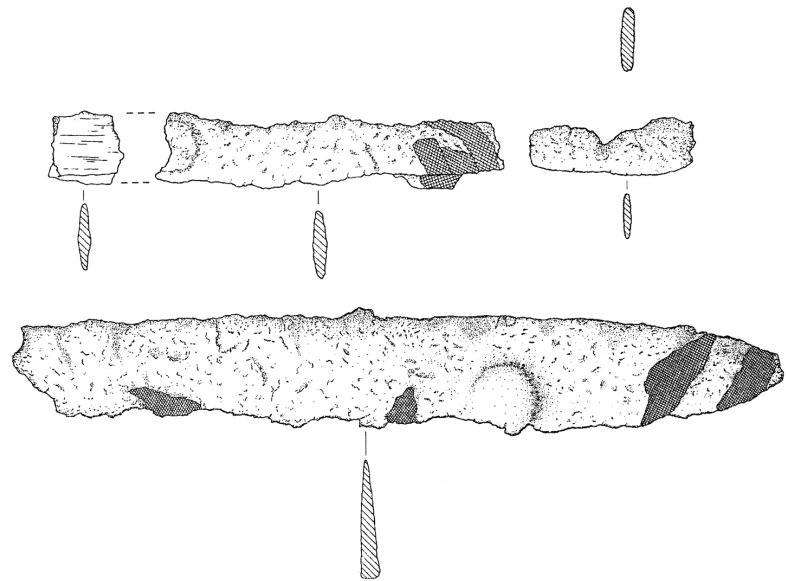


Fig. 9.9. Textile traces on knives from Tomb 1 at Cales, 7th century BC (After Chiesa 1993, Pl. X no. 37, Pl. XI no. 39).

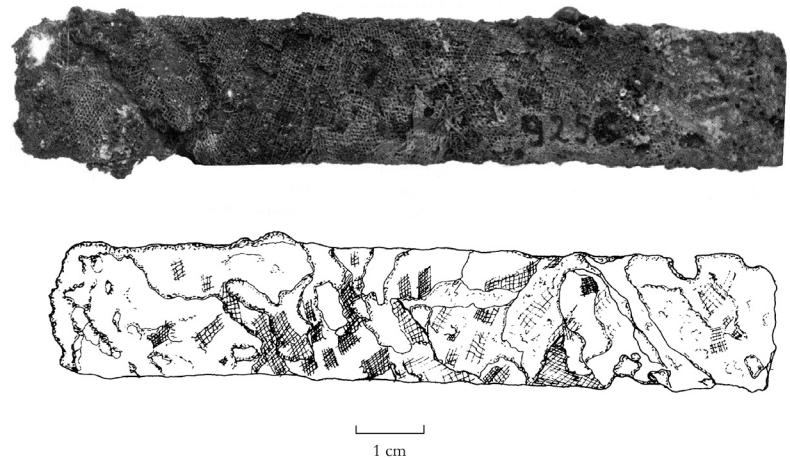


Fig. 9.10. Iron knife with textile traces, Tomb 41A, Vassallaggi, 5th century BC (After Pizzolo 1999, 230 fig. 15, 376 Fig. 112 b).

Of the surviving textiles, most are garments. The luxurious mantles and other clothing articles of Verucchio are almost complete garments and provide a glimpse of what some of the ancient costumes looked like. Apart from them, a set of under- and over-leggings and shoes from Vedretta di Ries (Fig. 9.3) and a sock from Padova (Maspero 1998, 63, fig. 20) are evidence for lower body attire, probably during cold periods. Otherwise, costume reconstruction on the basis of textile finds is difficult, since most of them are small fragments.

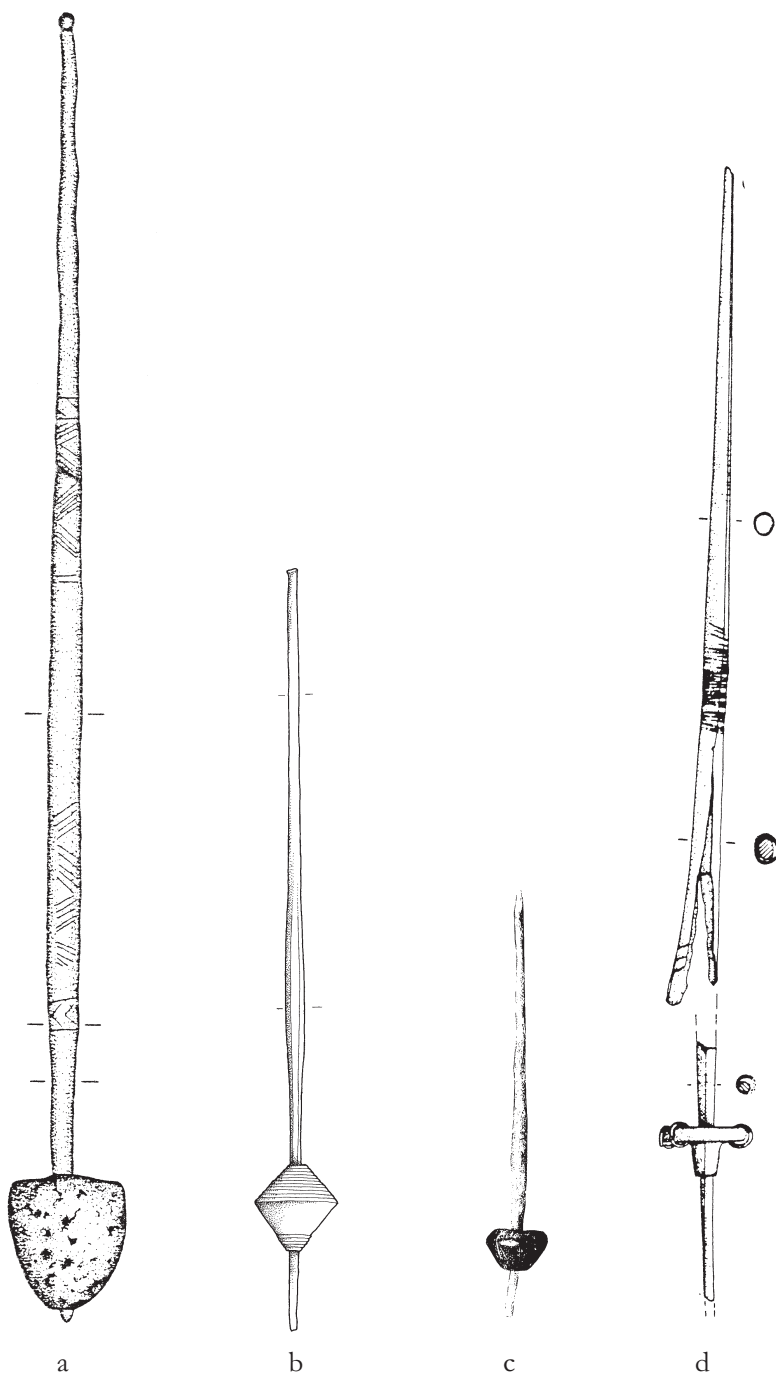


Fig. 9.11. Spindles: a) Gran Carro, 9th century BC (After Tamburini 1995, fig. 51 no. 2081); b) Tomb 56 Benacci-Caprara, Bologna, 7th century BC (© Bologna, Museo Civico Archeologico); c) Tomb B, Casale Marittimo, 7th century BC (After Esposito 1999, 62 Fig. 55); d) Tomb 23, Este Casa di Ricovero (After Chietto Bianchi 1987, 215 Fig. 33 no. 97).

Nevertheless, textiles mineralised on metal articles of personal decoration such as bracelets, belts, and, most commonly, fibulae

also provide an idea of contemporary clothing. Thus, when traces of different weaves are found on the same fibula (Figs 9.4–9.5), as for example in some of the Alfedena finds (Bedini *et al.* 1975 *passim*; Parise Badoni and Ruggeri Giove 1980 *passim*) and Traquinia (Buranelli 1983), it may be conjectured that the deceased was provided with several layers of garments or a garment and a shroud.

In addition, Italy possesses a very rich corpus of iconographic evidence of ancient garments. Clothing depicted on figurines, statues, vases and tomb paintings is often rendered with minute details of shape, pattern, technique and colour. For example, the late Etruscan statue of Aulus Metellus has been demonstrated to have sufficient details to reconstruct not only his garments but also the techniques of their manufacture (Granger-Taylor 1982).

Even if textiles do not survive, their presence is indicated through other evidence, such as the presence of fibulae and various decorative ornaments. Sometimes, reconstructions of garments are possible based on the position of surviving decorative elements in relation to the skeleton, sarcophagus, or trench, as in the case of female costumes for the burials of Allianello (De Juliis 1996, Figs 108–109).

In some cases, the dead were provided with very sumptuous dresses made of wire mesh and precious glass and/or amber beads, as attested by the finds from Verucchio (Stauffer 2002), Castel di Decima (Bedini 1976, 287) and the Isis Tomb at Vulci (Roncalli 1998, 20). Whether such a garment would have been used in life is a debatable issue. Still, the majority of clothing articles found in graves could have been, and most likely were, worn by the living. Confirmation comes from the Verucchio garments, which have wear marks and, hence, must have been used in life.

Occasionally, textile remains are found on the inside of the armour, suggesting that they may have belonged to a lining or a garment worn under the metal, as in the case of the finds from Tarquinia (Helbig, 1874, 257–258; Kilian 1977, 26–27 no. 5; Barber 1991, 194; Banck-Burgess 1999, 231) and those from Sesto Fiorentino (Rilli 1964, 35; Bonfante 1989, 1385).

The shrouds, on the other hand, were most probably made specifically for funerary purposes. Traces of one such cover have been noted in Tomb 3 at Osteria dell'Osa (Fig. 9.6),

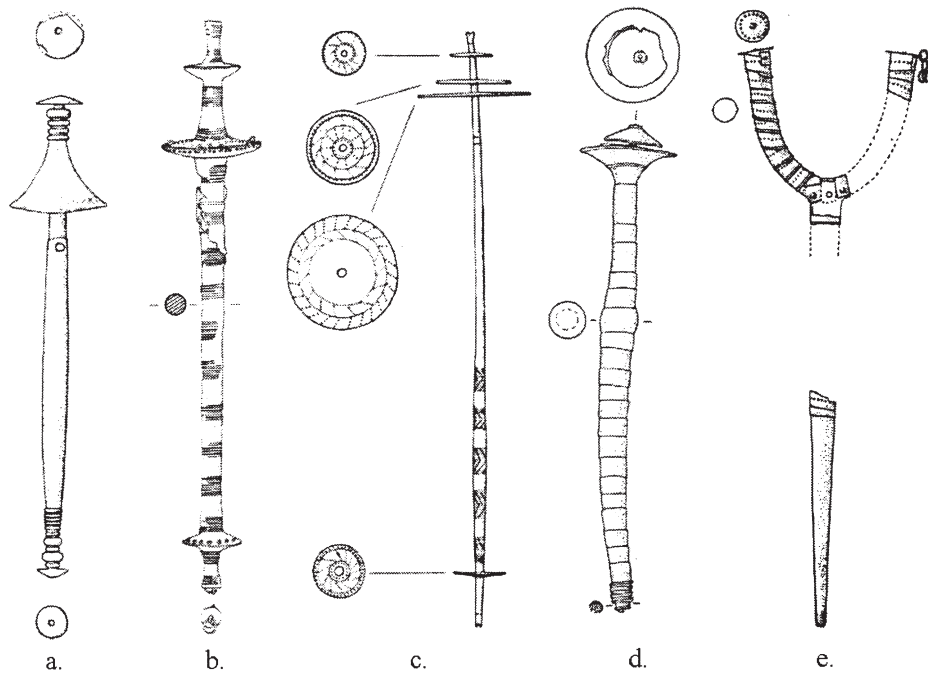


Fig. 9.12. Distaffs:
 a) Bronze, Tomba HH 11-12, Quattro Fontanili, Veio (After Cavallotti Batchvarova 1965, Fig. 54); b) Bronze, Tomba 47, Osteria dell'Osa (After Bietti Sestieri 1992, Fig. 3a.403 no. 10); c) Bronze, Tomba AA 12A, Quattro Fontanili, Veio (After Cavallotti Batchvarova 1965, 71 Fig. 12); d) Amber, Tomba 47, Rocca Malatestiana, Verucchio (After Forte 1994, 79); e) Wood and bronze, Tomba JJ 17-18, Quattro Fontanili, Veio (After Close-Brooks 1963, Fig. 93).

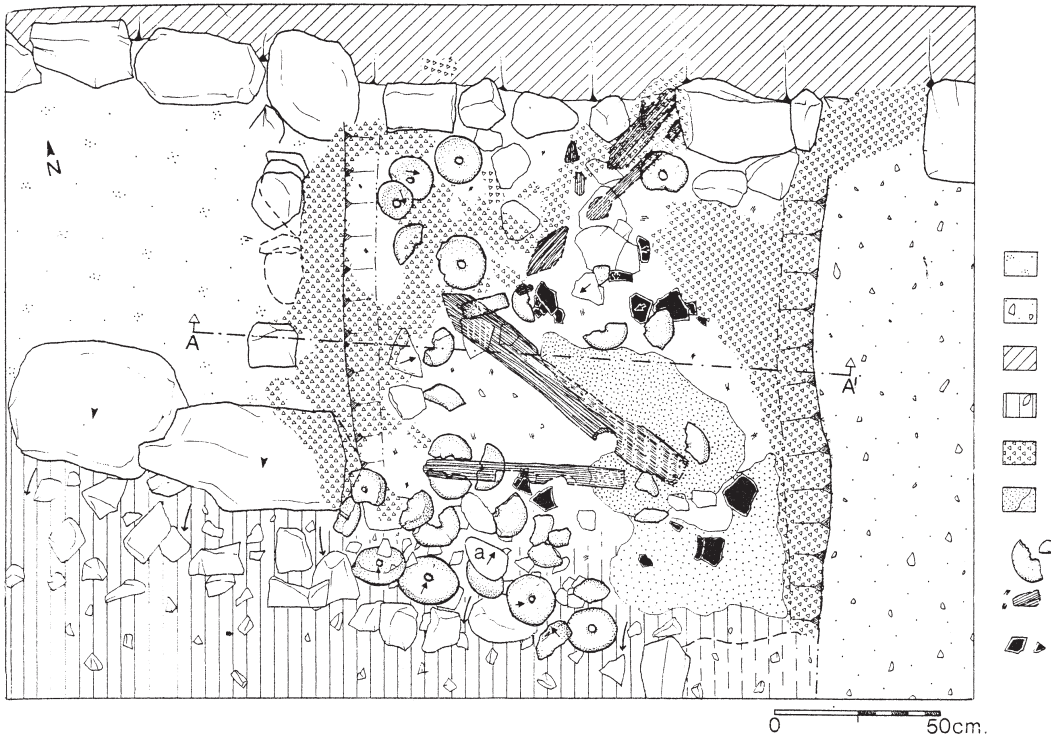


Fig. 9.13. Remains of a loom, Santorso, 6th century BC (After Balista et al. 1985, 81 Fig. 23).

thanks to the rectangle of small bronze rings and buttons that were probably sewn onto the edge of the cloth (Bietti Sestieri 1992, Fig. 3a.391). The dark trace of the shroud is still visible in the soil of the burial, which is on display in Museo Pigorini in Rome. A simple textile identified as a shroud was preserved on a

metal breastplate from the Etruscan or Capena area (Tomedi 2000, 46 no. 71).

Another use of textiles, particularly linen, in burial ritual was to wrap cremated bones. Many scholars connect this practice to a ritual described by Homer for the burials of Hektor and Patroklos (*Iliad* 34.796 and 23.254), which



Fig. 9.14. Loom weights found in situ, Room 5, Poggio Baccherina, 5th century BC (After Paolucci 1997, 55).

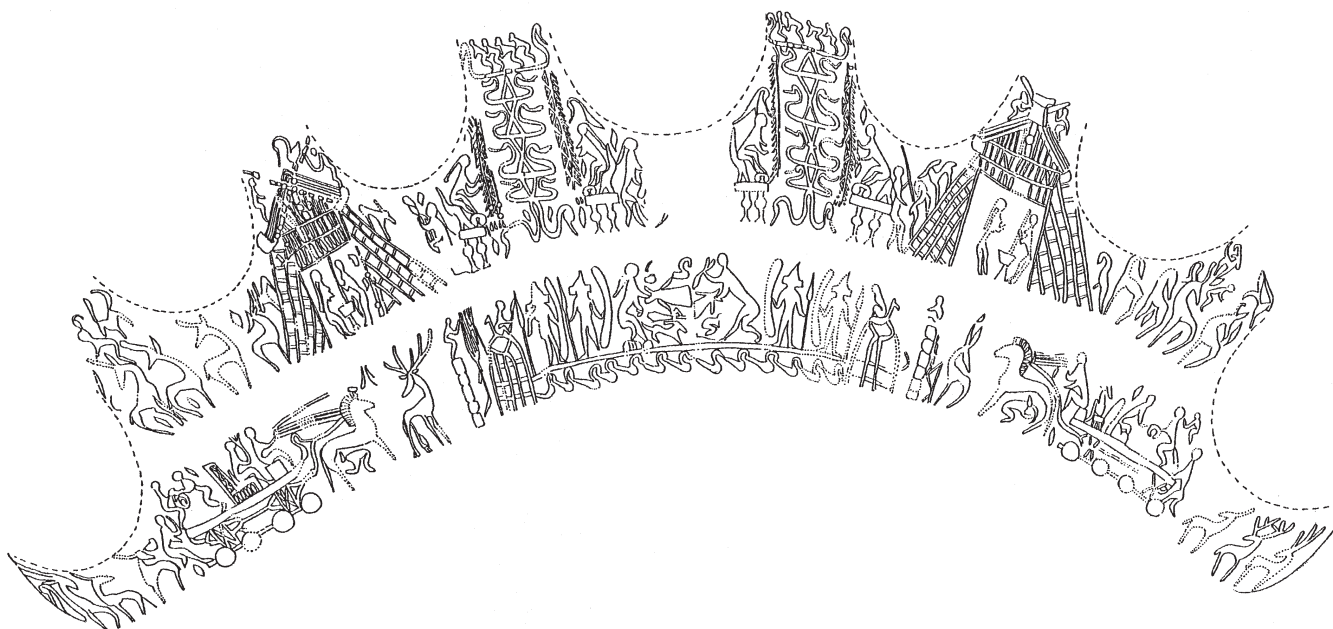
is assumed to have been adopted by the elites throughout the Mediterranean during the Iron Age (Bérard 1970, 28; d'Agostino 1977, 59–60). It is probable that the rite was adopted by the native populations of Italy from Greek, specifically Euboean, colonists. In fact, in Greece, textile fragments have been found in similar circumstances at Eretria and other sites (cf. Spantidaki and Mulherat in this volume). The earliest evidence of this practice in Italy comes from Cuma (d'Agostino 1977, 60, 69) and Pontecagnano (d'Agostino 1977, 14, 60), sites that were the first to come into contact with Euboeans. This 'Homeric' ritual then

spread quickly among the Etruscan and Italic elites, as attested by the textiles from Casale Marittimo (Esposito 1999, 71), Vetulonia (Torelli 2000, 582 no. 130), Veio (Carroll 1973) and other sites.

A different and possibly native Italian tradition seems to be attested by the finds from central and north Italy. The cremated remains or the cinerary urns at Chiusi and Este, as well as urns in the burials of Verucchio and Bologna (von Eles 2006b, 73) were wrapped in textiles that were then fastened with fibulae, as if a garment was being worn (Fig. 9.7). These textiles have been interpreted as clothing for the urns, and thus as representing the deceased (Bonfante 2003, 106 note 3). It has been suggested that if Villanovan biconical urns represent the deceased, the incised geometric patterns similar to Hallstatt woven motifs are intended to represent a garment (Tuck 1994, 626). Chiusine 'canopic' urns may strongly support this theory. The tradition was probably much more widespread. While textiles do not usually survive, the position of various small decorative objects, such as fibulae, around the urn (Fig. 9.8), may indicate the presence of a cloth, which they fastened. Such, for example, is the case of several cinerary urns at Tarquinia (Trucco 2006, 98–99).

Many of the mineralised textiles indicate that, apart from cinerary containers, certain metal objects came into close contact with textiles because they were intentionally wrapped

Fig. 9.15. Scenes from the Throne of Verucchio, Tomba del Trono, Rocca Malatestiana, Verucchio, 8th century BC. Two central scenes in the top register depict women at their looms (After Kossak 1999, Fig. 44).



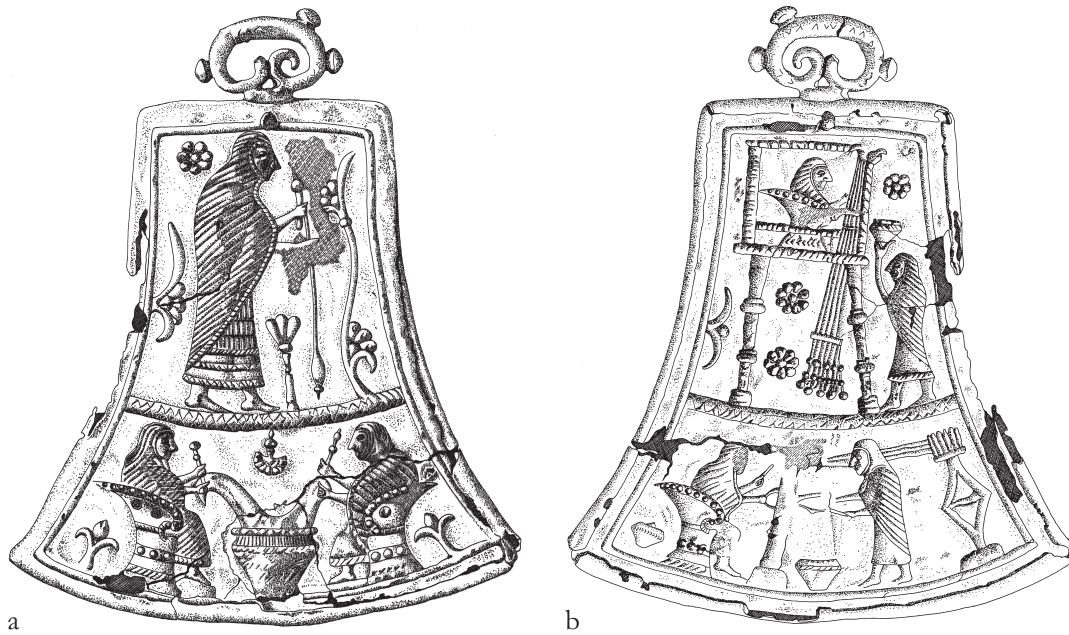


Fig. 9.16.
Tintinnabulum from
Bologna, *Arsenale
Militare*, Tomba degli
Ori, bronze, late 7th
century BC: a) side A,
with scenes of spinning
(top) and dressing the
distaffs (bottom);
b) side B, with scenes
of weaving (top) and
warping (bottom)
(© Bologna Museo
Civico Archeologico).

or enclosed in fabric. Already Lenticchia (1921, 34) noted the use of textiles for protecting metal objects. Knives, weapons, strygils, spits and mirrors are among the most common objects to bear textile traces. At Cales (d'Agostino 1977, 14, 60) and Vassallaggi (Orlandini 1971), for example, most of the knives were subjected to this procedure (Figs 9.9–9.10). In some cases, the traces are clear enough to reconstruct the direction of a cloth band wrapping a particular object. The deposition of thus 'enclothed' objects in urns excludes the possibility of accidental contact with textiles. It is unclear whether this phenomenon has a ritual significance in a funerary context or represents a regular practice of safekeeping the precious metal objects. The pseudomorph on a bronze dagger blade from the Montemerano hoard (*cf.* Bazzanella in this volume) indicates not only that the practice of wrapping weapons may go beyond the burial context but also that such a practice existed already in the Bronze Age. The finds indicate that wrapping was common throughout Italy, and the evidence from the princely burial at Hochdorf, in Germany, where all objects were carefully wrapped in cloth (Banck-Burgess 1999 and in this volume), suggest that it had a wider, pan-European significance.

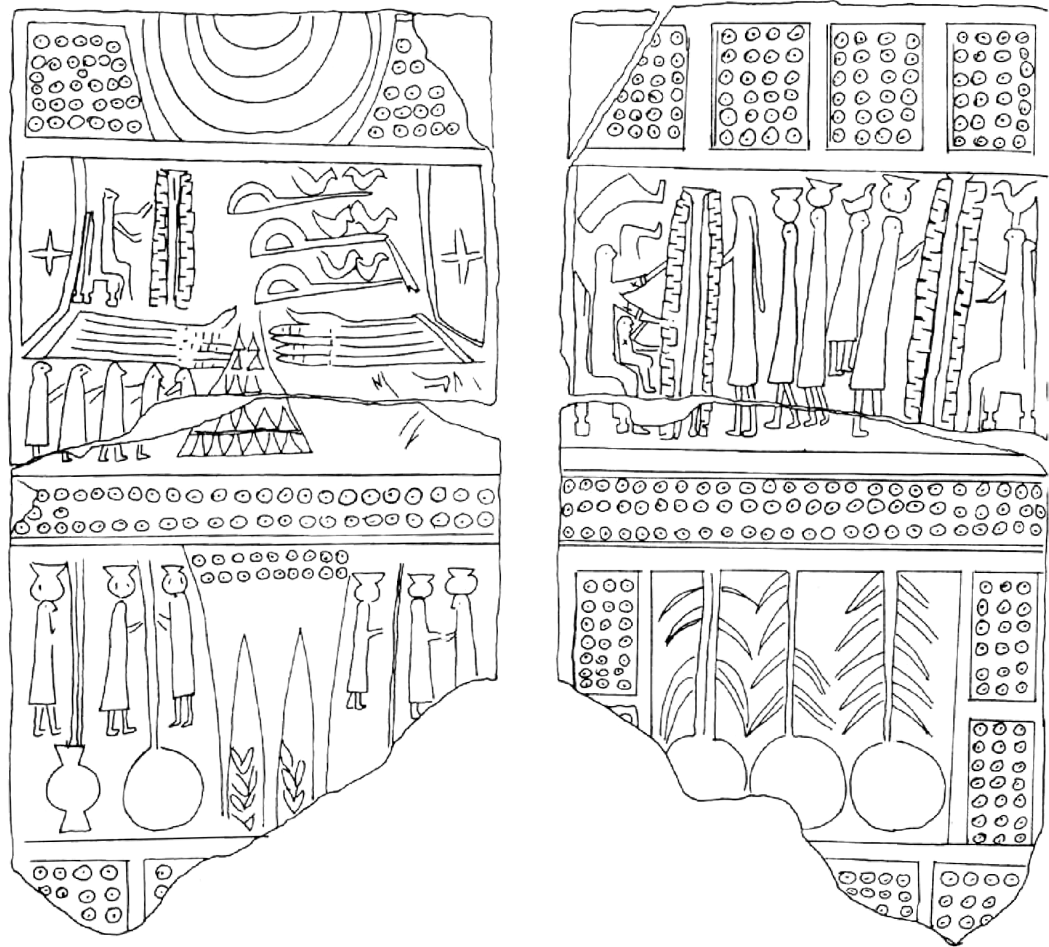
Colourful bed covers, cushions and other utilitarian textiles are frequently represented in Etruscan and Campanian tomb paintings (Steingraber 1985; Pontrandolfo and Rouveret

1992). Unfortunately, these textiles survive even less frequently than garments and are rarely recognised as such when they do. Thus far, only the mineralised textile from the tomb of La Montagnola at Sesto Fiorentino (Rilli 1964, 35; Bonfante 1989, 1385) has been interpreted as a fragment of a bed cover.

Although no direct evidence for wall-hangings in Italy appears in the form of textile remains, a clear indication of their existence is provided by the ceiling and wall paintings in the tombs of Tarquinia. Checks and small flowers on the ceilings are unquestionably textile patterns, the entire tombs representing tents or pavilions with roofs made of cloth (Holloway 1965; Stopponi 1968; 1983, 39, 41; Naso 1996, 349–352). Hangings on the walls and furniture of the Hochdorf burial suggest yet further possible uses of textiles within a funerary context (Banck-Burgess 1999).

Another important use of textiles—especially linen—was for sails and ship rigging. Etruscans were well known throughout the Mediterranean as sailors and were notorious pirates according to their enemies. Etruscan ship-building technology, including the use of the earliest foresail, was among the most sophisticated for the period (Hagy 1986; Bonino 1989; Turfa and Steinmayer 1999). While no sail fragments survive, pieces of rigging have turned up in shipwrecks. Etruscan-Roman shipwrecks from Pisa San Rosore yielded many cordage elements (Lentini and Scala 2002; 2005; Camilli *et al.*

Fig. 9.17. Daunian stele showing seated women at their looms in upper register of both sides, 7th–6th century BC (After D’Ercole 2000, 330 Fig. 1a–b).



2006, 52 no. 22), while the Punic shipwreck off Marsala contained numerous rope elements (Frost 1981).

A rather unique use of textiles known specifically in the Etruscan area is for books. Called *libri lintei* by the Romans, they were made of linen and used for recording religious rituals (Roncalli 1980; van der Meer 2007). Fragments of one such book, the so-called Zagreb mummy wrappings (Krall 1892; Roncalli 1980; *Liber Linteus Zagabriensis* 1986; Flury-Lemberg 1986; 1988, 344–357, 496; van der Meer 2007) were preserved in Egypt. Evidence for their use also exists in Etruscan art and Latin literature (Roncalli 1980).

Textile Production

Archaeological indicators of productive activities include installations, tools, residue or by-products, unfinished or defective products and raw materials. The vast majority of surviving evidence for textile

production consists of tools (see Gleba 2008a). Occasionally, installations, such as dyeing vats can be recognised. The heaps of muricid shells remaining from the production of purple can be regarded as residues or by-products of the latter process. Raw materials and unfinished or defective products are almost non-existent.

While no tools relating to flax processing survives from Iron Age Italy, some evidence for wool procurement does exist. More developed sheep breeds present at the time did not moult and their fleece had to be cut off, a process accomplished with the help of shears or a knife. Shears appeared during the Iron Age and all of the known examples are iron. In fact, their invention is tied to the use of iron, which is more springy than bronze (Forbes 1956, 8; Barber 1991, 29). All ancient shears found in Italy are of the same design, with two triangular blades (knives) on a simple U-shaped spring (White 1967, 119–120). Their size ranges from 10 to 30 cm in length. The vast majority of the archaeological examples derive from the burial

contexts in north Italy. It has been suggested that the practice of the deposition of shears in male burials in north Italy, populated at the time by Celtic tribes, may express the wool-based wealth of the Celts, who appeared there by the 4th century BC (Vicari 1994, 241).

Spinning activity is well attested archaeologically in both burial and settlement contexts in Italy. Several wooden spindles are known for the Iron Age. A long spindle, with its whorl still on the elaborately decorated wooden shaft, was recovered from the underwater village of Gran Carro, dated to the early 9th century BC (Fig. 9.11a; Tamburini 1995, 169 no. 2081 Fig. 51 no. 2081). Wooden spindle shafts have been identified at the waterlogged Iron Age site of Longola di Poggiomarino (Claude Albore Livadie, pers. comm. 2007). At least four other items were found in a 6th-century BC context in the Sant Omobono sanctuary area of Rome, their length ranging from 16 to 30 cm (Pisani Santorio 1977, 57, fig. 18; *Enea nel Lazio* 1981, 147 no. C64a–b). In addition to the rare surviving wooden and bone items, there are examples made of metal, all of which were found in burial contexts (Fig. 9.11b–d). One example is a bronze spindle with a bronze biconical whorl from the 8th-century BC Benacci-Caprara Tomb 56 in Bologna which still had some thread wound around it at the time of discovery (Fig. 9.11b; Forte and von Eles 1994, 55 no. 32).

Since most spindles in antiquity were made of wood, often, the only evidence for their use consists of the less perishable spindle whorls. The vast majority of spindle whorls in Italy are made of fired clay; however, whorls made of luxury material such as glass and amber have also been found in burial contexts throughout the 1st millennium BC. Spindle whorls, often in large numbers, have been found practically on every settlement site in Italy and the majority of sites yield a variety of whorl shapes, although often a specific type predominates, suggesting either that it was traditional at the site or that the site specialised in a certain yarn and, consequently, a certain type of textiles.

The second spinning tool, the distaff, is also attested in the Italian archaeological record, albeit only in a burial context (Fig. 9.12). While wooden tools have not survived, numerous examples of objects identified as distaffs made of luxury materials have been found in tombs of notable wealth (Bartoloni 1989, 42–44).

The distribution of different types indicates regional production, and their presence in particularly rich female burials of the Early Iron Age suggests that distaffs conferred status, and were thus of important social significance (Gleba 2008a, 109–122).

Weaving in pre-Roman Italy was accomplished on a warp-weighted loom. The evidence for weaving activity consists of loom remains. Occasionally, carbonised elements of the wooden beams are preserved in association with loom weights, which allows speculation about their probable position. For example, the 6th–5th-centuries BC Structure D10 at Pozzuolo del Friuli preserved a line of weights, concentrated in the south-west end of the structure, with clear carbon traces of wooden beams in the soil (Vitri 1992, 22–25, figs. 8, 13–15). A small room at Santorso had carbonised wooden beams, the largest measuring 85–90 by 10–11 cm, while a smaller one was 40 by 3–4 cm (Fig. 9.13; Balista *et al.* 1985, 79–82). Likewise, at the 4th–3rd century BC building at La Piana, some of the carbonised wood timbers, found together with an accumulation of loom weights near the north wall in one of the rooms of the house, probably were fragments of a loom frame (Whitehead 1996, 114, and Figs 6 and 8).

The commonest evidence of the warp-weighted loom, however, consists of loom weights, which were made of fired clay, and therefore survive well in archaeological contexts, allowing us to trace the presence and sometimes even location of a warp-weighted loom on sites. The trapezoidal shape seems to have been prevalent in 1st millennium BC Italy, and varies from pyramidal to almost cuboid. Conical weights appear in the Archaic period and discoid weights are typical for the Hellenistic period. However, different types frequently coexist even at the same site, not to mention different settlements, even located near each other, making chronological comparison difficult. Depending on the site and the period, they vary in weight from less than 100 g to a few kilograms.

In exceptional cases, loom weights are found *in situ*, having fallen to the ground when the warp to which they were originally attached was destroyed or deliberately cut. At Francavilla Marittima, in the so-called Weaving Hut, dated to the second half of the 9th and the 8th centuries BC, two rows of large loom

weights were found more or less *in situ* (Attema *et al.* 1998, 337). At Gravina di Puglia, House 2 had 31 loom weights were found on the floor, assumed to belong to a set (Wilson 1977, 132). At the Hellenistic settlements of Oppido Lucano (Lissi Caronna 1983, 295, 332; Lissi Caronna *et al.* 1992, 238, 277–285) and Monte Sannace (Scarfi 1962, 160; Donvito 1982, 168–169), in south Italy, numerous houses yielded sets of loom weights, ranging in number from 20 to over 80. In the Casa dei Pithoi at Serra di Vaglio, dated to the late 4th–early 3rd century BC, 108 loom weights were found next to the south-west wall, and carbonised remains of large wooden beams were visible during the excavation (Greco 1991, 62). Other groups of loom weights found *in situ* have been excavated at Forcello di Bagnolo S. Vito (Vay 1988), Poggio Bacherina at Chianciano (Fig. 9.14; Paolucci 1997, 56–57), Aquarossa (Nylander and Pelagatti 1986, 125 n. 282; Östenberg 1975, 11–12), Pithekoussai – Punta Chiarito (De Caro and Gialanella 1998, 345, fig. 5) and Himera, Sicily (Allegro 1976, 557).

Tablet weaving in Italy is attested by tablets, terracotta spools, metal clasps and bone spacers with pegs (*cf.* Ræder Knudsen in this volume).

While direct evidence for finishing processes such as bleaching or fulling is presently absent in the Italian archaeological record, Verucchio textiles provide the first hard evidence of pleating (von Eles 2006a). The evidence for dyeing activities is limited to the heaps of broken muricid shells. These have been found at Mozia (*Mozia* 1989, 40; Reese 2005). Here, too, were found sperm whale vertebrae, which have been interpreted as platforms for breaking the shells (Reese 2005). Large piles of muricid shells were still visible on the Monte dei Coccioli of Taranto during the 19th century, remnants of the dyers' establishments on the Mar Piccolo (Forbes 1956, 136, 162; Morel 1978, 104; De Julius 2000, 81). Finally, the evidence of sewing activities consists of numerous finds of bronze and bone needles.

Iconographic evidence provides further information about the textile production process. One of the earliest known depictions of the warp-weighted loom, in fact, comes from Italy (*cf.* Bazzanella in this volume). From the 1st millennium BC, an important scene related to textile production appears on the

wooden cylindrical throne found in Tomb 89 at Verucchio (Fig. 9.15). While interpretations of the intricately carved scenes vary (Gentili 1986, 244; Torelli 1997, 68–69; Kossack 1999, 64–67; von Eles 2002), most scholars agree that spinning and weaving are among the activities depicted.

Another important object comes from the area of Bologna and is one of the most significant representations of textile production in the ancient world, a bronze *tintinnabulum* found in Tomb 5 of Arsenale Militare necropolis and dated *c.* 600 BC (Fig. 9.16; Morigi Govi 1971; Kossack 1999, 67–68). Each side of the *tintinnabulum* is divided into two sections, allowing space for four scenes depicting various stages of textile manufacture. The bottom scene of side A depicts two women seated in throne-like chairs, reminiscent of the Verucchio throne, each holding a distaff in her left hand. With her right, each pulls a strand of fibre from the basket in the centre, that is, they are dressing the distaffs for spinning. The top scene of side A shows a woman at the task of spinning. She is standing in profile, extending her left hand to hold a dressed distaff, while a spindle hangs from her right hand, which draws out the yarn. Side B of the *tintinnabulum* represents activities associated with weaving. The bottom scene most likely represents the weaving of the starting border necessary for the warp-weighted loom (Stage 1985, 56; Barber 1991, 116). The top section shows a woman weaving assisted by another woman. This representation is unique as it shows what may be the only two-storied loom known from antiquity.

Other relevant finds are a pair of the 5th–4th century BC stone stelae from the Bologna area. One such stela shows a woman standing in profile holding a dressed distaff in a fashion similar to the spinner on the *tintinnabulum* (Zannoni 1876, pl. C.13; Stage 1985, 47). Another group of anthropomorphic stone stelae depicting what have been interpreted as weaving scenes are known from Daunia, dated to the 7th–6th centuries BC (Nava 1980; D'Ercole 2000). The scenes show women seated in front of a vertical loom, from which hang two meander-patterned bands (Fig. 9.17).

Conclusions

Surviving evidence demonstrates the abundance and variety of textiles and their uses in

1st millennium BC Italy. Garments, utilitarian fabrics, sails, even books were made of textiles. Different functions required different properties, which in turn demanded different choices and careful planning at various stages of textile production. The textile finds from Sasso di Furbara and Verucchio, with their use of spin-patterning and tablet-weaving technique, demonstrate that, by the 8th century BC, a sophisticated technology with the capacity to produce highly complex and labour-consuming textiles existed in Italy.

Apart from a few exceptional sites, there is no evidence for major craft centres during the Bronze Age, and textile production seems to be concentrated in the individual households, indicated by small groups of loom weights and single spindle whorls found throughout the settlements. Towards the end of the 2nd millennium BC, there is a small increase in the numbers of implements, but production appears to be still geared towards making basic subsistence products for the individual household. The Early Iron Age brings more variety in terms of tools that correspond to a wider array of textiles produced. It is also the period when textile implements first appear in burials, indicating a shift in the social perception of the craft and, possibly, specialisation among some members of the community. Textile production has moved to a new level, becoming one of the main economic activities and sources of wealth.

It is during the Orientalising and Archaic periods that we see a significant increase in the scale of textile production, indicated by the large number and standardisation of tools. Frequently, textile implements are concentrated in specific areas where other kinds of production, such as ceramic or metal, have been documented, providing evidence for a household or even workshop mode of manufacture, and the existence of at least part-time specialist craftspeople. Specialised production certainly took place in the sanctuaries, as indicated by the large numbers of textile implements concentrated in specific areas of the sacred precincts, as at the Santa Venera sanctuary at Paestum (Greco 1997) or at Lavinium (*Enea nel Lazio* 1981, 218–219). In the same period, textile implements start appearing in votive contexts (Gleba 2009). At some sites, specialisation begins in the manufacture of a particular kind

of cloth, which is even more evident in the post-Archaic period, when relatively large-scale textile production can be postulated for some sites on the basis of archaeological evidence. The intensification of textile production to increase the output for the purpose of exchange can be achieved very quickly without economic or technological revolution (Horden and Purcell 2000, 352). In this way, demand stimulated the specialisation of certain sites in textile manufacturing. Thus, at Gravina di Puglia, sheep husbandry was practised in the Early Iron Age, but an economy based on wool did not develop there until later (Watson 1992, 97), when large numbers of loom weights excavated in the Hellenistic levels of the settlement indicate a large-scale textile production for trading purposes.

Other textile-producing centres are known from literary sources: among these are Tarquinia, Sibari and, especially, Taranto. At Taranto, while the archaeological material for the site is problematic, we know from ancient authors that sheep husbandry produced the celebrated wool that was worked and transformed on the spot, while on the coast of Mar Piccolo there existed dyers' workshops that produced purple (Forbes 1956, 136, 162; Morel 1978, 104; De Juliis 2000, 81). There is a mention of an *estalopia* or a clothing market, which may have been located in the agora (De Juliis 1984, 331). During the Hellenistic period, Taranto may also have been the centre of gold thread production (De Juliis 1984, 331).

While there is no evidence that textile production in Italy ever reached an industrial scale of organisation before the Roman period, there is strong indication of a manufacture mode, which quantitatively greatly exceeded simple subsistence production.

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Case Study: The Textiles from Verucchio, Italy

Annemarie Stauffer

Fig. 10.1. Verucchio, tomb 89 (Tomba del trono): Fragment of a looped textile found among the remains of the pyre (© Cologne University of Applied Sciences).



Introduction

Knowledge of the clothing types and clothing traditions of Pre-Roman Italy is principally based on the Etruscan culture with its detailed

iconographic record preserved in the form of wall paintings and sculptures, depicting colourful dresses and decorative textiles such as blankets, cushions and canopies (cf. Steingräber 1985; Bonfante 1975/2003). However, for the pre-Etruscan, so-called Villanovan culture, such illustrative representations of garments are largely missing, although material compiled by Larissa Bonfante in her seminal *Etruscan Dress* (1975/2003) reflects a high level of textile technology already in the Late Bronze/Early Iron Age. Nearly all research on Pre-Roman costume in Italy has been based on interpretations of these sources, as relatively few original textiles survive (cf. Gleba 2008 and in this volume). Thus, basic information on textiles and garments in Villanovan times is largely missing, e.g. information on material and binding used for textile production, on colours and colour schemes, and on additional decoration such as embroidery or appliqués. The Villanovan textiles from Verucchio have changed this situation, yielding a great deal of detailed information on materials, colours and tools used for textile production in the Early Iron Age. The finds from Verucchio are testimony to sophisticated weaving methods and techniques. Moreover, dyestuff analyses give a clear idea of colours used and preferred

by the contemporary aristocracy. The large spectrum of finds from different tombs provides reliable information about textiles and clothing. Furthermore, the textiles from princely tombs reflect social importance as well as individual wealth: they are symbols of status and identity.

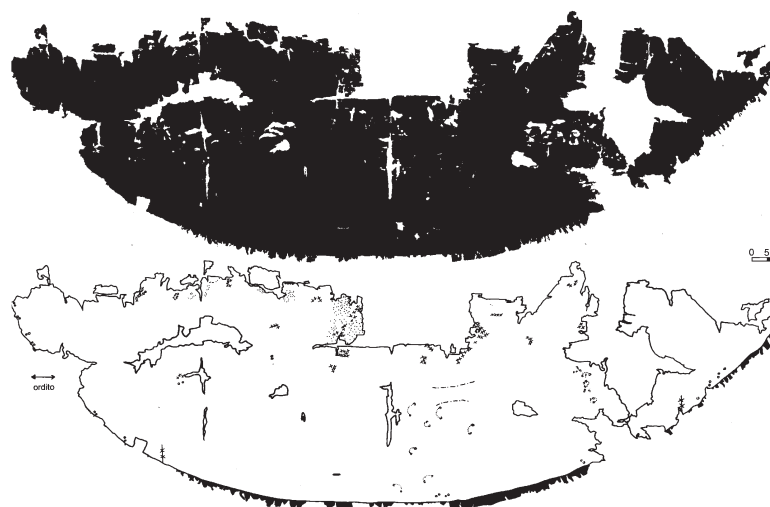
Verucchio

Verucchio is situated on the hills on the eastern side of the Apennines facing the Adriatic Sea. The inhabitants of Verucchio took advantage of its excellent strategic and topographical position in the vicinity of the Adriatic coast, situated on an important trading route connecting the Baltic regions with the central and southern parts of Italy. The aristocratic families from Verucchio were largely involved in the amber trade. Their wealth is reflected by the extraordinarily rich amber finds found in their tombs (Forte and von Eles 1994).

In the 1970s, a large group of aristocratic male and female tombs dated between 725 BC and 650 BC was excavated at different necropoleis around Verucchio (von Eles 2002, 5–11 [topographical situation and necropolis]; 273–275 [dating]). At all the various necropoleis, a considerable amount of organic material, such as food remains, wooden furniture and textiles had been preserved. Immediately after the excavation most of the textiles underwent special consolidation treatment.¹ In the beginning of the 1990s, the Soprintendenza Archeologica in Bologna initiated an international project focused on the documentation and scientific research of all the items found at Verucchio. In the course of the project, the textiles were brought to the University of Applied Sciences in Cologne for conservation and research.² The investigations of the numerous finds are in progress.

Functional Textile Groups

The large quantity of textiles found in the tombs in Verucchio can be separated into two groups according to their function within the burial ritual. The first group comprises textiles used for the burial itself: garments and cloths to cover the dead body and blankets for the funerary pyre. Fragments of the latter were found in the large urn from Tomb 89. Analyses



of these fragments yielded a series of various types of textiles, all very different from those deposited in the tomb chamber (Stauffer 2002, 212–215, 217–219; 2003). The remains in the urn consisted of both fragments of very fine fabrics, some of them additionally decorated, and fragments of colourful but coarser twills with loops at one side, possibly fragments of blankets. Due to a special chemical process of preservation (see Stauffer 2002 and 2003), all these textiles have kept their vivid colours (Fig. 10.1). The textiles arranged on the pyre were burnt with the body. Small remains were gathered and placed in the urn together with the ashes.

The second group consists of garments

*Fig. 10.2. (top)
Verucchio, Tomb 89:
Mantle 1 (© Cologne
University of Applied
Sciences).*

*Fig. 10.3. (above)
Mantle 1: spin pattern
(© Cologne University
of Applied Sciences).*

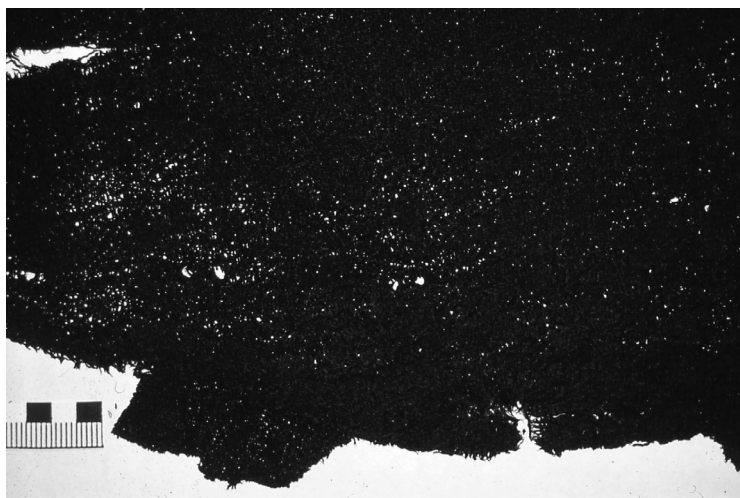


Fig. 10.4. Mantle 2: paired stitches (© Cologne University of Applied Sciences).



Fig. 10.5. Verucchio, Tomb 89: Amber knobs with paired holes (© Verucchio Museo Archeologico).

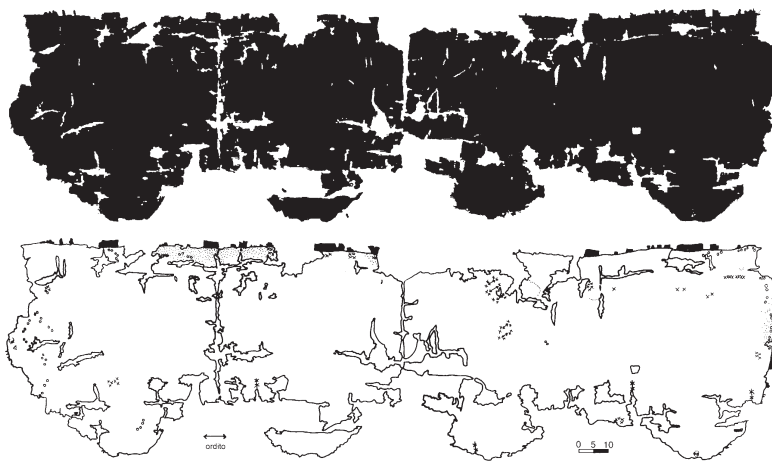


Fig. 10.6. Verucchio, Tomb 89: Mantle 2 (© Cologne University of Applied Sciences).

deposited in the tomb *after* the body was burnt and interred. Constituting a part of the personal set of burial goods (*corredo*), these garments are not everyday objects; rather, together with other items such as the chariot, furniture, weapons and jewellery, they communicate the social and political status of the deceased.

Ceremonial Garments from Tomb 89/ Tomba del Trono and Tomb 85

One of the richest tombs and probably the most important excavated thus far is Tomb 89, the so-called *Tomba del Trono*, a chieftain's burial from around 700 BC (von Eles 2002, 273–275).³ A completely preserved wooden throne with figural scenes, displayed on top of the wooden chest containing the ashes and the garments, marked the chieftain's outstanding position in the community (von Eles 2002, 235–272).

The tomb contained two semicircular mantles and a small almost square textile of very fine texture with stitched hems on all four sides. Regrettably, it is not possible today to reconstruct the position of the different garments within the context of the tomb. The excavation diary mentions only one garment, draped on top of the urn. On the other hand, Mantle 1 – generically termed *vestito* by the excavator – is said to have been spread on top of the chest, covering two thirds of its contents, including the urn. Furthermore, the *vestito* is said to have been decorated with fibulae, a custom known from other sites as well.⁴ In fact, traces of fibulae arranged, not in a functional, but rather in a decorative manner are noticeable on Mantle 1 (see below). Although nothing certain can be said about the position of the three large garments within the context of the tomb, the garments themselves provide an unprecedented amount of information about clothing, its production, technology and use, as well as its social significance in contemporary society.

Mantle 1 (Inv. 13541)

The first of the ceremonial garments found in Tomb 89 is a large semicircular mantle woven in twill and decorated with a tablet-woven border running all around the edges (Fig. 10.2). Today, it measures 257 × 82 cm but the original size of approximately 264 × 88 cm can be easily reconstructed. The mantle's shape is rather a segment than a true semicircle. Warp and weft are spun from fine sheep wool. It is woven in 2/2 twill with a thread count of around 24–26

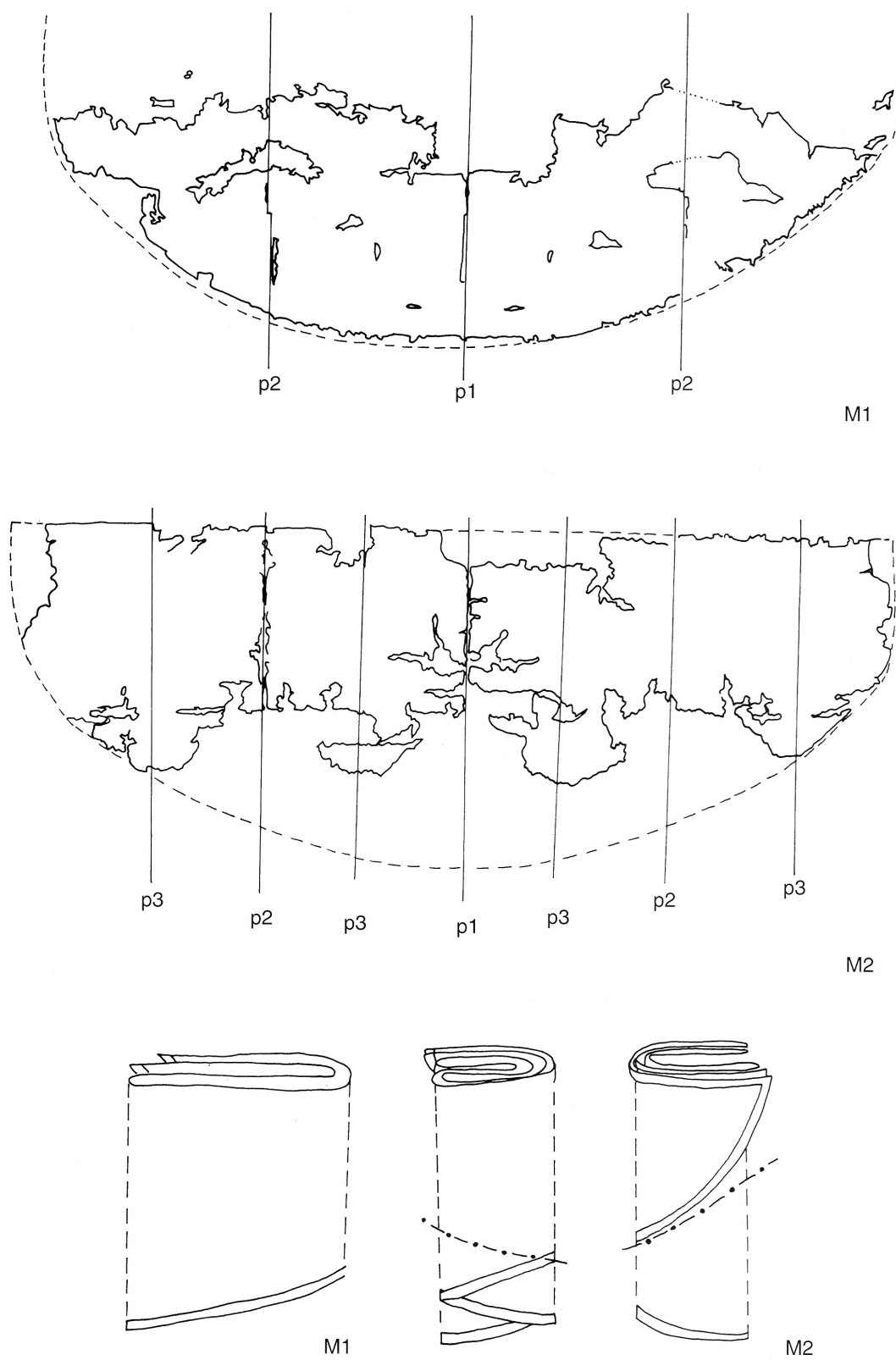


Fig. 10.7. Verucchio, Tomb 89: Reconstruction of the mantles and folding systems (© Annemarie Stauffer).

Fig. 10.8. *Mantle 2: Tablet border* (© Cologne University of Applied Sciences).

threads per cm in one direction and 12–14 threads per cm in the other.⁵ The semicircular mantle is perfectly woven without any cut threads visible at the edges. Thus initially, it was neither possible to define the warp and weft, nor determine the outer side of the garment.

The mantle was woven in the so-called spin pattern (Fig. 10.3). In both warp and weft, the pattern consists of regularly alternating groups of s- and z-twisted yarns; the sequence is mostly 6s, 6z. Some irregularities in the weaving system parallel to the straight edge consist of groups of two, eight or even 10 threads of s- or z-twist. In the other direction

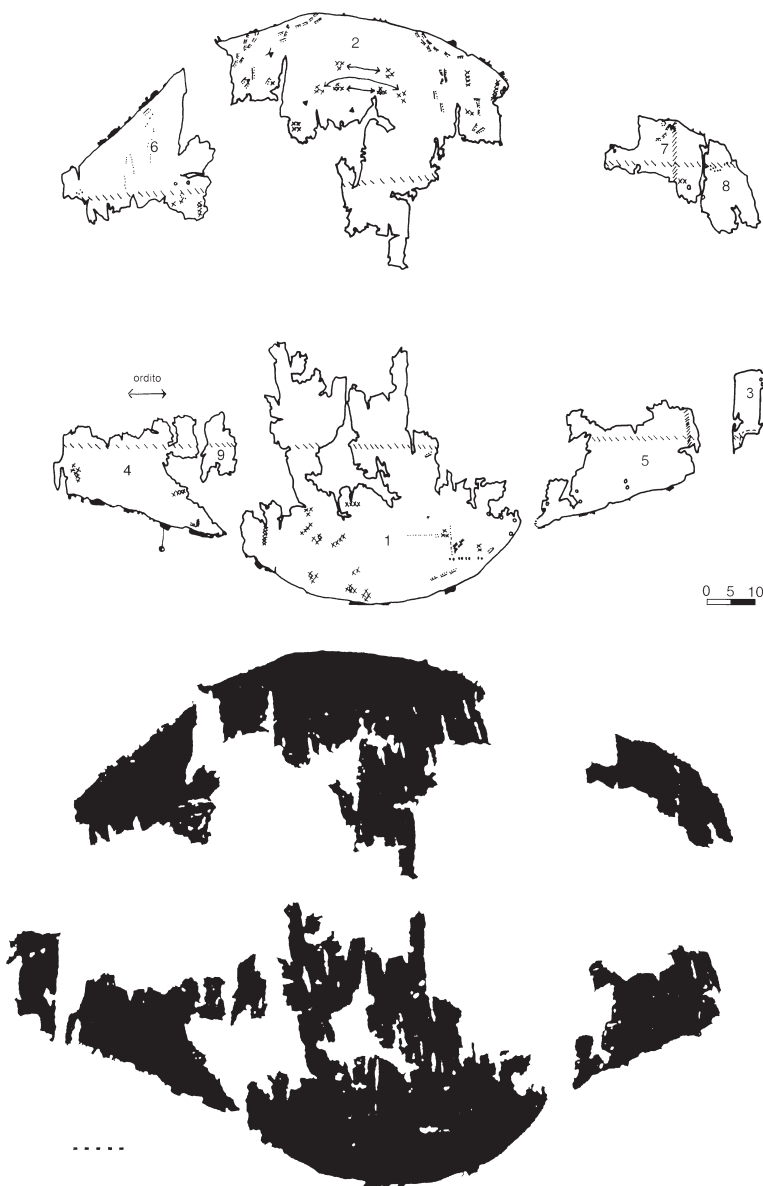
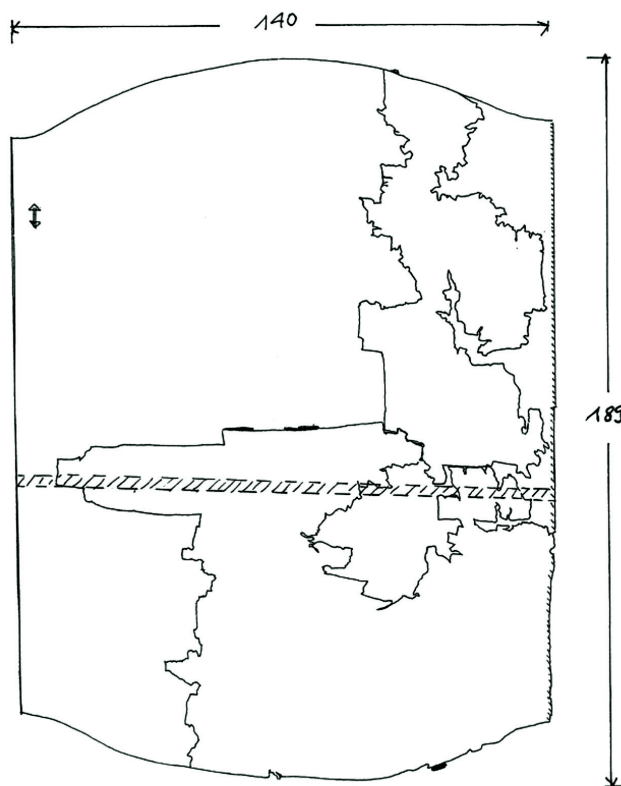


Fig. 10.9. *Verucchio, Tomb 85: garment M3* (© Cologne University of Applied Sciences).



such irregularities are rare *cf.* Ræder Knudsen in this volume.

The decorative border is preserved partially on the curved edge but missing on the straight top. However, the similarity between the two mantles (see below) indicates that the decoration of the edges originally continued there as well. The border was added to the garment after the completion of the ground weave. It was woven with 36 tablets in continuous turn (Ræder Knudsen 2002 and in this volume). The pattern consists of a row of triangles over three horizontal stripes (Fig. 10.4), an ornamental motif widely spread in Villanovan and early Etruscan art (*cf.* Bonfante 1975, 16). No obvious weaving mistakes could be found in any of the fragments.

The mantle was red with a purple border. It was woven from dyed yarns and not piece-dyed. The red colour was produced using a plant dye, primarily containing purpurin.⁶ The original colour was probably similar to that of the looped fabric found among the ashes of the pyre (see Fig. 10.1). The well-preserved colours on the latter provide an indication of the mantle's beautiful and striking red colour. The decorative border was clearly separated from the ground weave, being woven in

another technique with a different pattern and colours. Thus, it was obviously both decorative as well as a mark of distinction, which could be recognised from a distance.

Traces of further decoration could be detected along the top straight edge where remains of stitching are visible. The holes are too regular to have been caused by insects and they rather indicate applied decoration, which has disappeared. Another group comprises areas or rows of paired stitching holes. They, too, appear to be the traces of appliqué. The presence of thousands of small amber beads and glass pearls found in the same tomb supports the possibility of this kind of decoration. The most interesting traces of further embellishment are paired holes arranged regularly alongside the curved edges (Stauffer 2002, fig. 65). The paired stitching holes are noticeable (Fig. 10.5). Their diameter and the distance between the two holes correspond exactly to the perforations present in the bottom side of a series of cone-shaped amber knobs found in the tomb (Fig. 10.6). Obviously, the mantle's edges were decorated with the beautiful amber buttons. When the sewing thread, probably of plant fibre, disintegrated, the decorative elements fell off.

Fig. 10.10. Verucchio, Tomb B/1971: garment A and reconstruction drawing (© Cologne University of Applied Sciences).

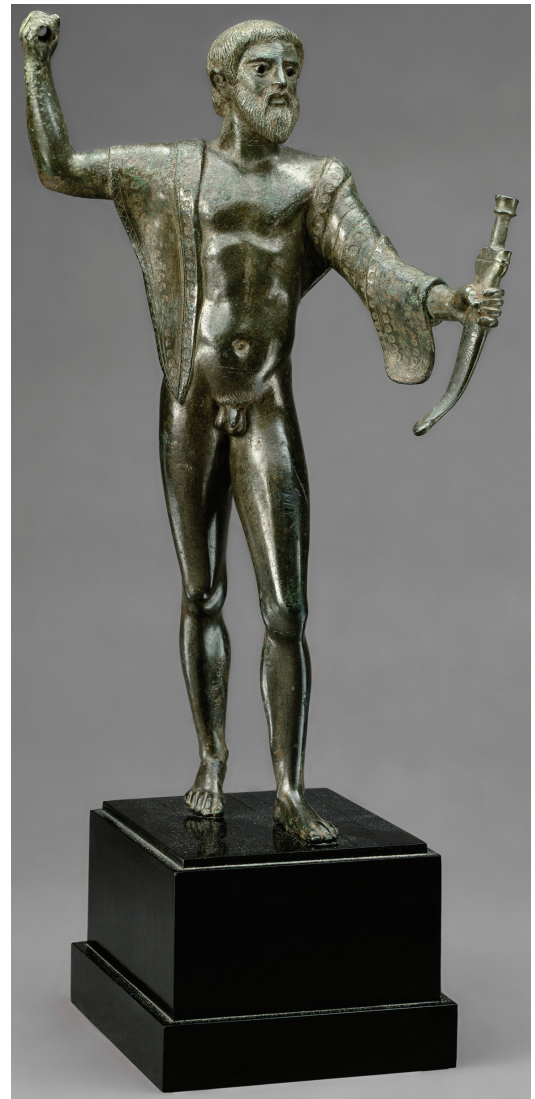


Fig. 10.11. Verucchio, Tomb B/1971, garment A: pleated pattern forming squares (© Cologne University of Applied Sciences).

Fig. 10.12. Etruscan bronze figurine wearing a mantle, Kansas City Museum (© Kansas City Museum).

Mantle 2 (Inv. 13529)

The second garment found in the chieftain's tomb had an upper straight edge of 259 cm with a height of 72 cm and initially appeared quite different to the first (Fig. 10.7). Its upper straight edge, decorated with a tablet-woven border, is largely preserved. Remains of a tablet-woven border at both sides point to curved outer edges. The curve corresponds to the shape of the first mantle. Its lower edge has four regular pointed corners. However, the shape of these corners appears to be accidental: neither traces of turning wefts nor any remains of tablet weaving could be found. Therefore, the shape of the mantle today is most likely due to damage inflicted during excavation. Creases in the ground weave clearly



indicate that the mantle had been folded three times along the vertical axis. Thus the edge with the tablet border originally formed a decorative cascade (Stauffer 2002, 200–202). During excavation, the lower edge broke off and thus the mantle received its present shape with the four pointed corners (Fig. 10.8). By extending the curved outer edges on each side, it is possible to reconstruct a garment with almost exactly the identical shape and dimensions as Mantle 1 (see Fig. 10.10). Further similarities in structure and weaving technique prove that the second garment was originally a semicircular mantle. The ground is woven in 2/2 twill with a spin pattern produced by s- and z-twisted threads arranged in groups of 6 in both weaving systems; the thread count of 22–26 threads per

cm in one direction and 12–16 in the other corresponds to the first mantle. Irregularities in the sequence of s- and z-twisted yarns can be discerned in the system running parallel to the upper edge.

The tablet-woven border also shows the same pattern of triangles over three bars as the border in Mantle 1 (see Fig. 10.4). The second mantle was also red, but the threads running from its top to bottom also contained a trace amount of a yellow flavonoid dyestuff. They formed the weft of the tablet weave, whereas the warp of the tablet border was dyed red and blue. Mantle 2 had been additionally decorated with appliqués as well. The most spectacular decoration was a row of large amber knobs attached alongside the curved edges. The paired stitching holes are well visible (see Fig. 10.5).

Neither of the two mantles is woven exclusively for the burial. Traces of wear, such as holes left by fibulae, prove that they had been used in life. On the first mantle, for example, many paired stitches could be documented on the left shoulder (Stauffer 2002, Fig. 65).

Garment 3 (Inv. 13530)

A third textile from Tomb 85 is not as well preserved (Fig. 10.9). The larger fragments with curved edges first appeared to be part of another semicircular mantle. However, during the analysis it turned out to be a garment of completely different shape. It is woven in one piece with four curved edges. The central part where the neck opening would have been is not preserved, but the edges are almost completely intact. The garment measured at least 103 cm in one and 105 cm in the other direction. The ground weave is a 2/2 twill with a spin pattern formed by alternating groups of 6 s- and 6 z-twisted threads. With a thread count of about 19–20 threads/cm in one direction and 14–16 in the other, it is slightly coarser than the two mantles. A number of irregularities in the vertical direction helped to reconstruct the garment. Minute fragments of irregular running stitches and traces of an additional blue fabric on one side indicate the presence of a lining of the garment, which was probably made in a textile woven from plant fibre and thus was not preserved. Running stitches and the traces of a blue weave are not consistent, however. The traces from a blue textile might also have been caused by contact with another

garment wrapped together with this garment but no longer preserved.

All the edges of the garment are decorated with a continuous tablet-woven border made with 13 tablets after the ground weave had been completed. Unlike in the mantles, the tablet-woven border does not have any pattern besides simple stripes produced by tablets turned regularly in an S/Z/S/Z direction (*cf.* Ræder Knudsen in this volume), although it was visually separated from the ground weave by its bluish hue. Traces of any additional decoration such as appliqués and beads were not detected.

The function and appearance of the garment still requires further research. If we assume that a neck opening was located in the middle, it could be worn like a long shirt or a tunic with short woven-to-shape sleeves. Garments of possibly this type are depicted on the wall paintings in Tarquinia (Steingraber 1985).

Rectangular Textile (Inv. 13451a)

Another textile from Tomb 89 is a small rectangular piece, measuring 22 × 29 cm (Stauffer 2005). It is woven in 2/2 twill, with 16–18/16–18 threads/cm. The quality of the weave with a spin pattern is fine and resembles that of the two semicircular mantles. However, the spin pattern is different to all the other textiles found in Verucchio, showing regular sequences of 14s, 14 z threads/cm in one direction and 2s, 2z, 2s, 6z in the other. Thus the spin pattern is characterised by fine herringbone-like stripes. The edges are cut and sewn in overcast stitching with a wool thread, indicating that the item was made for a specific purpose. It could be a part of a garment, a wrapping of a precious object or something else.

Ceremonial Garments from Tomb B/1971⁷

Two garments of completely different shape than those from Tomb 89 were found in the tomb of a male aristocrat dated to about the same time, *i.e.* around 700 BC. The first garment – object A – might belong to the grave goods of Tomb 85.⁸ The provenance of the second garment is confirmed as belonging to Tomb B/1971.

Object A (Inv. A)

Garment A is preserved in two large fragments (Fig. 10.10), which contain sufficient

information for a plausible reconstruction. It was made of a cloth of rectangular shape with two straight and two curved sides. The curved edges determined the dimensions of the long side, since on the larger fragment, the central line was visible. Thus, the original size of the cloth, 189 by 140 cm, could be reconstructed. When folded horizontally in the middle, it would have had the shape of a long sleeveless tunic with open sides and curved lower edges (Fig. 10.10 right).

The curved edges are finished by a narrow tablet-woven border. Fragments of the border could also be found in the middle of the garment thus indicating the presence of an opening, which is further substantiated by Lise Ræder Knudsen's analyses of the tablet border (Chapter 11 in this volume).

The garment is made of wool, woven in balanced 2/2 twill (18/20 threads/cm) with a spin pattern of the same type as in the garments from Tomb 89. A remarkable feature is a broad stripe of about 3 cm in width present about 13 cm below the neck opening (see below), in the system parallel to the curved edges, which was produced by using only s-twisted threads. The stripe is too broad to be a fault and must have been added on purpose. The garment was blue: both warp and weft tested positive for indigotin. The tablet borders could not be tested for dyestuffs, as they were too narrow and too heavily impregnated with consolidant.

This large garment with its straight side edges and its rounded lower ends bears evidence of another type of male attire, very different from the garments found in Tomb 89. However, not only is the shape different, but it also possesses another remarkable feature. Under a strong lateral light, a regular system of folds in both directions could be detected on the surface of the garment, forming small rectangles (Fig. 10.11). The rectangles are of very similar dimensions, about 4×3 cm, thus bearing evidence that they must have been made deliberately. Moreover, convex and concave lines follow a decorative sequence. By mapping these convexities and concavities, a regular symmetrical folding pattern can be detected, at least in a vertical direction.⁹ The pleats run over the tablet-woven borders thus bearing evidence that the pleating was done after the garment had been finished. The pleating folds in a longitudinal direction do not

run straight down in parallel lines but become larger at both curved edges, a fact indicating that the garment was used before its deposition in the tomb.

When pleated, the garment must have looked quite different than it does today. Its shape was optically minimised and it would have looked rather more like a *chiton* than a sleeveless tunic.

It is not quite clear how the garment was worn. Considering the fine materials, the exquisite weave, the colour, the borders and the time-consuming pleating, it must have been a very special garment. It is of great interest that as in the case of the two mantles from Tomb 89, a second example of this type of garment is preserved in Verucchio, probably from the same Tomb B/1971.

Object B (Inv. B)

The second garment of probably the same shape is much decayed and the labels of the fragments have been partially mixed when they were mounted between Plexiglas sheets. The reconstruction of this garment is not yet complete, but it appears to be of the same shape as Object A, with two vertical straight edges and two curved ones. The curved edges are decorated with a patterned tablet-woven border. The central part with the neck opening is missing. Thus, the garment's height cannot be reconstructed exactly, but it was longer than 190 cm, while the width was slightly narrower than that of garment A. The ground weave in balanced 2/2 twill (18/20–22 threads/cm) is similar to all the garments described above. Similar to garment A, a large stripe of only s-twisted threads runs in a horizontal direction. Again, it is too large to be an irregularity. Moreover, the stripe is located in about the same position as on garment A, indicating that it was woven on purpose. The large garment was also pleated in both directions. The small squares cover the entire surface, but they are of slightly larger dimensions than on Object A. In terms of shape, weave and pleating, garments A and B are very similar. One main difference, however, is that garment A was blue while garment B was dyed red.

Conclusions

The extremely well-preserved garments of Verucchio have shed new light on clothing

and textile production in Iron Age Italy. The most astonishing garments are without any doubt the two semicircular mantles. Several antique authors note that one of the main status symbols of a Roman citizen or *cives*, the large *toga* and especially the *toga praetexta*, was inherited from the Etruscans (Goette 1990, 10–12). Thus Pliny the Elder states the *praetexta* had its origins among the Etruscans (Plin. *NH* 8.195).¹⁰ The mantle called *toga* by the Romans was named *tebenna* (τεβεννα) by the Etruscans according to various Greek authors (Daremberg and Saglio 1912, 347–48 s.v. *tebenna*; Goette 1990, 12; Bonfante 1973, 612; Bonfante 1975, 15, 39, 45, 48–55, 102). Based on iconographic evidence, Larissa Bonfante suggested that *tebenna* appeared around the middle of the 7th century BC (Bonfante 1975, 48–55; cf. Stone 1994, 16: 4th century BC). Mantles 1 and 2 from Tomb 89 at Verucchio are the earliest *tebennae* known so far. Their perfect execution and many sophisticated details point to an even earlier use of this garment.

Special care and emphasis was placed on the production of the borders, especially those of the semicircular mantles. Distinguishable from afar, and clearly set apart from the ground weave of the garment by their technique, pattern and colour, they must have been signs of rank and status, as were the *lati clavi* and *angusti clavi* on Roman garments (Cleland *et al.* 2007, 35). The importance of the border is additionally emphasised by the way it was technically produced. There is no doubt that, the fabric of the mantle was woven first and the border added subsequently, using a special kind of high vertical loom (see below and Ræder Knudsen in this volume). This brings us to a much discussed question: what were the special characteristics of the *toga praetexta*? Today, the general opinion is that *praetexta* refers to the wide purple border of the ceremonial garment, which was woven first. Yet the *tebennae* from Verucchio demonstrate that we probably should interpret *toga praetexta* more literally: the toga was woven first and the border afterwards.

The two mantles from Verucchio already display all the main characteristics of the later Roman *toga*, although their shape differs from the late Etruscan toga as depicted on the bronze statue of the so-called Arringatore, c. 150 BC (Dohrn 1968; Granger-Taylor 1982;

Goette 1990, 21, 106 cat. 2 tab 1.1, 13.4). The small height of only 88 cm combined with a width of 264 cm made the garment appear more like a *stole* than a mantle. Thus, it was surely draped in a different way than the classic *toga*. Important hints as to how such a garment was draped are provided by an Etruscan bronze statuette from around 600 BC (Fig. 10.12) showing a male deity clad in such a mantle (Richardson 1983, 206, Pl. 144, Figs 479–480). The mantle covers only parts of the figure's back while the long end is wound several times around his arms. Similarities between the mantle of the sculpture and the garments from Verucchio are further enhanced by the decoration incised on the border, showing the triangles over three stripes, a pattern similar to the tablet-woven borders of Mantles 1 and 2. Another decorative element depicted on the statuette's mantle consists of rosettes, formed by little incised circles, which may reflect amber appliqués and glass beads that most likely also decorated the mantles from Verucchio. The artist rendered all the characteristics of the garment in great detail.

Detailed technological analyses of the weaves and especially the tablet-woven borders prove that, in many cases, very time consuming work processes were employed instead of more efficient ones, although the result would not be different visually. This indicates, however, that certain processes of spinning, weaving and making tablet borders were obviously bound by special rules, a fact that had been observed for other cultures as well (Bender Jørgensen 2003b). The borders, for example, were produced in some cases in a much more time consuming way than technically needed (see Ræder Knudsen in this volume). These observations indicate a phenomenon that Lise Bender Jørgensen has noted in another context: things are done not for their visual impact but according to tradition or for a specific purpose (Bender Jørgensen 2003a, 74). Such production details raise the questions of how the knowledge of producing garments was transferred and by whom, and who their recipients were. These questions direct our eyes towards the iconographic evidence, which shows that there is still more complexity inherent in the symbolism/tradition of cloth production. The Bologna *tintinnabulum* and the wooden throne found in Tomb 89 at Verucchio (see Figs 9.15 and 9.16 in this volume) feature

scenes depicting various stages of textile manufacture. Both are prestige objects in their own right, indicating not only that textiles constituted a source of wealth and/or status for their owners, but also that specialised textile production, specifically the manufacture of ceremonial garments, was the prerogative of the elite women represented.¹¹

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Notes

- 1 Most of the finds were soaked with Primal AC33; see Stauffer and Weiße 1999.
- 2 The research project run by the Soprintendenza per i Beni Archeologici dell'Emilia Romagna in Bologna and the University of Applied Sciences Cologne is headed by Patrizia von Eles and Annemarie Stauffer. The main collaborators in the project are Lise Ræder Knudsen and Ina Vanden Berghe. Special thanks go to Chris Verhecken-Lammens, who analysed and reconstructed the looped textiles. Preliminary reports were published in Stauffer and Weiße 1999; Ræder Knudsen 2002; Stauffer 2002; 2003. The project was generously supported by the Fritz Thyssen Stiftung, Cologne. In the meantime, more garments have been reconstructed and their publication is forthcoming.
- 3 Tomb 89 has been dated back slightly to 725–700 BC, as stated by Patrizia von Eles during a conference at Lund University in 2003.
- 4 For Gentili and Sani's diary, see von Eles 2002, 13–21, especially Fig. 8. For clad urns, see von Eles 2002, 22–29 [A. Bojardij]; Stauffer 2002, 194.
- 5 The density is irregular due to the stretching during conservation treatment in Bologna in 1972.
- 6 All the analyses were undertaken by Ina Vanden Berghe. The results published in 2002 were revised on the basis of new tests.
- 7 Formerly called Tomba B/Strada Marecchiese.
- 8 The fragments of Tomba B/1971 and Tomba 85 had been mixed while mounted between safety glass sheets or labelled incorrectly.
- 9 Pleating in the horizontal direction was nearly completely destroyed by the conservation treatment in the 1970s.
- 10 *Praetextae apud Etruscos originem invenere.*
- 11 That certain steps of textile production or certain qualities constituted the privilege of aristocratic ladies was already discussed by Torelli 1997; Bartoloni 2000; Stauffer 2002, 211–212; von Eles 2002, 265–266.

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Case Study: The Tablet-woven Borders of Verucchio

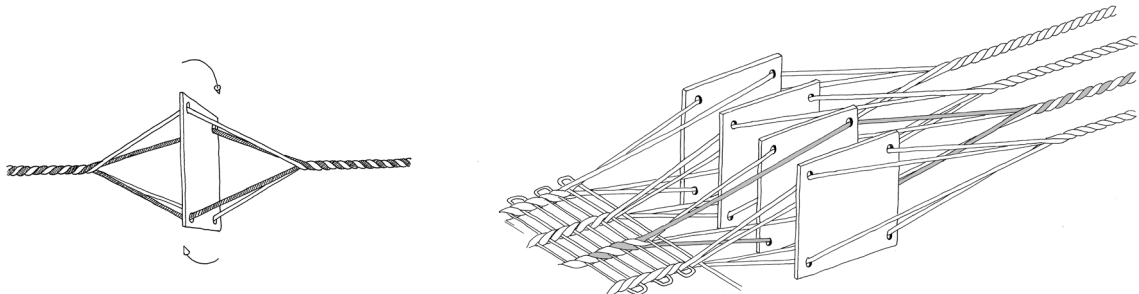
Lise Ræder Knudsen

Fig. 11.1. The use of a tablet loom. Left: A tablet with a thread in each corner is twisted around a horizontal axis and the four threads are twisted as a cord. Right: More tablets set beside each other make it possible to create borders and bands. There will be a twist of the threads both on the near side of the tablets, where the border is woven, and on the far side of the tablets (Drawing: L. Ræder Knudsen).

Introduction: Tablet Weaving

Tablet weaving is an ancient technique used to make bands and borders. The weaving equipment is very simple, consisting of little square tablets, often made of wood, about 5 × 5 cm or smaller in size, and with a hole in each corner. For very narrow borders only a few tablets are needed, while wide bands, known from archaeological material, would require more than a hundred such tablets (*cf.* *Halvorsen* in this volume). Four threads are threaded through the holes of each tablet (Fig. 11.1). These threads constitute the warp of the tablet weave. The tablets are raised upright and the far end of the warp is fixed to some sort of stationary device. Often, the near end of the warp is fixed to the belt of

the weaver, but it could as well hang from the ceiling. Once everything is set up, the weaving can begin. Tablet weaving involves rotating or turning the tablets forward or back, which forms a shed through which the weft thread passes. Looking at a single tablet it is easy to see that the warp threads that pass through it are twisted together. These twisted warp cords are a characteristic sign of tablet weaving. The technique offers several different ways to make a variety of patterns and structures: using different colours in the warp threads, turning the tablets in different directions and inserting a supplementary thread as brocade weft. The method is suitable for weaving narrow bands, such as belts, starting borders for the warp of the warp-weighted loom, or



decorative borders. The latter use of the tablet-weaving technique is aptly demonstrated in the Verucchio material.

Verucchio Tomb 89/Tomba del Trono

In Tomb 89 at Verucchio, dated *c.* 700 BC, at least three garments with borders woven in a tablet-weaving technique were found (von Eles 2002). This chapter discusses the technique of tablet weaving and its specific use in the Verucchio garments (for which see Stauffer in this volume).

The Tablet-Woven Borders of Mantle 1

The tablet-woven border of Mantle 1 (Inv. 13541) decorates the curved edge of the mantle (Fig. 11.2). The straight top edge of the mantle is not preserved, but it is likely that it was also decorated with a border, as in Mantle 2 (*cf.* Stauffer in this volume). The border was woven using 36 tablets with 4 holes each. The warp yarn of the tablet weave is thinner than the yarn used for the ground twill fabric and is plied. The warp count of the border is about 15 tablets/cm; the weft count is 14 threads/cm. Despite the degraded state of the textile, it is possible to see that, in some places, two weft threads of the ground weave unite to form the weft of the tablet weave. The fringes created by the remaining warp and weft threads of the twill fabric of the mantle have thus been utilised as the weft of the border. The number of weft threads entering the border varies since the ground weave is not very regular (warp count varies between 22 and 26 threads/cm, and weft between 12 and 14 threads/cm) and furthermore, because fringes derive from both the warp and the weft of the ground weave in the curving edges of the mantle. Dye analyses (*cf.* Stauffer in this volume) indicate that the mantle had a reddish colour while the border was blue or purple.

The tablet-woven border of Mantle 1 was constructed in the following way. First, two tablets of opposite threading lie adjacent to the twill fabric. The decorative pattern of the border consists of 17 tablets creating a triangular motif achieved by changing the direction of tablets one at a time. The following 17 tablets form stripes, consisting of groups of three tablets turned in opposing directions.

The change in direction and the different twist of the weft threads create a subtle decorative pattern. In the places where the tablets change direction in the triangular motif, the weft is visible and since it had a different colour from the warp of the border, the triangles are more distinctive (see Fig. 11.5 which shows the nearly identical construction of the border of Mantle 2).

The weft of the mantle fabric continues as the weft in the tablet border and gives a superficial impression that the ground weave and the borders were woven simultaneously. However, a closer examination of the nexus between the fabric and the border reveals the original weaving method: two single threads from the fabric – each a weft in its own shed – unite into a 2-ply thread, which passes through the shed of the tablet weave.

This kind of border is created after the fabric was woven and taken off the loom. At the sides of the fabric, fringes are made during or after weaving the ground weave. The fringes of the fabric are then used as the weft in the tablet border. For every turn of the tablets, two weft threads from the twill fabric are passed through the shed of the tablet loom; they are then passed back through the next shed after turning the tablets in order to fasten the threads in an invisible and very strong way (Fig. 11.3). In the subsequent turn of the tablets, the spare threads from the first weft threads are passed through the tablet border and are cut just at the borderline between twill fabric and tablet border. Knowing these details makes it possible to see the weaving direction of the tablet border, as the weft going back into the shed will always be woven after the one going into the shed. As the weft is completely hidden inside the warp of the tablet border, these technical details are concealed if the border is well preserved, but since parts of this mantle are very fragmentary, it is possible to see details which would not have been visible when the mantle was new.

This way of making the border has various functions: the edge is strengthened, the threads which remain after weaving the twill fabric are fixed and the mantle is decorated with a border of a different colour and pattern. The technique is complex and would have required an extraordinary skill on the part of the weaver.

Fig. 11.2. (top left) The border of Mantle 1 from Tomb 89, Verucchio (Photo: L. Ræder Knudsen).



Fig. 11.3. (top right) Mantle 1: The fabric was woven first and afterwards fringes of the edges of the fabric were used as wefts of the tablet border (Drawing: L. Ræder Knudsen).

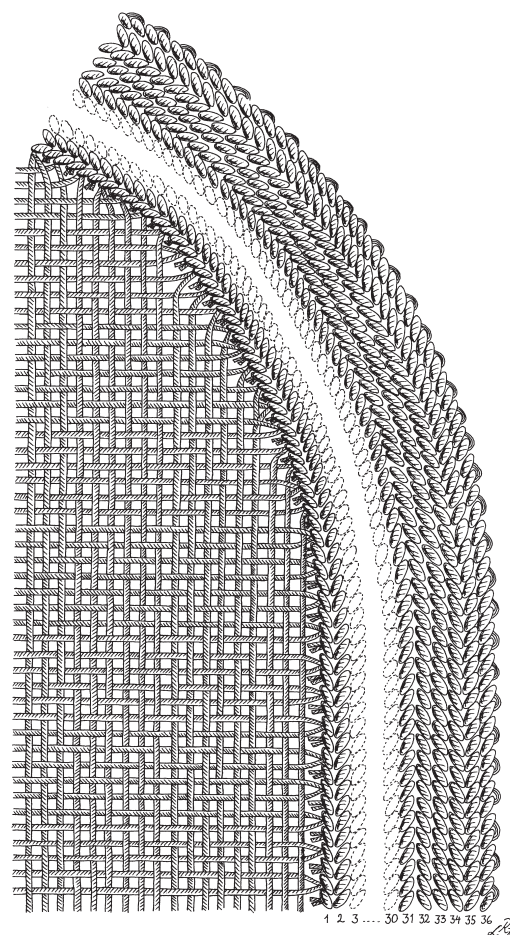
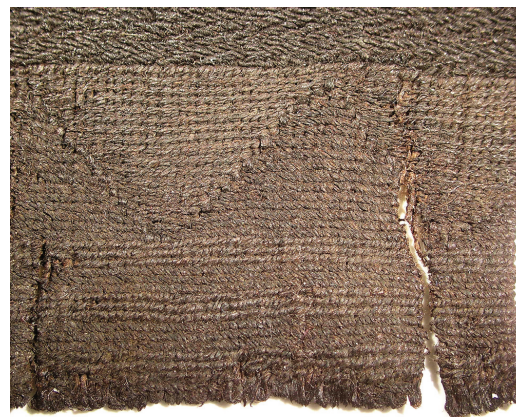


Fig. 11.4. (bottom) Mantle 2: Well-preserved tablet-woven border on the curved edge (Photo: L. Ræder Knudsen).

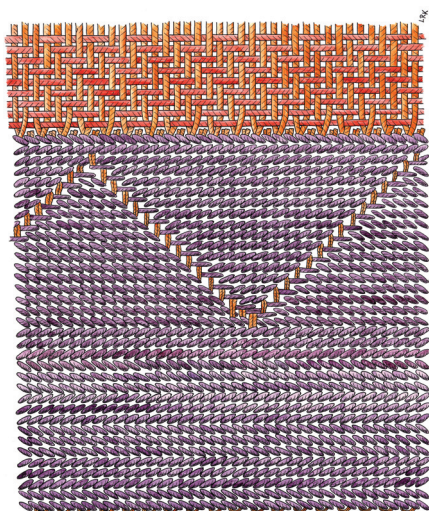


The Tablet-Woven Borders of Mantle 2

Mantle 2 (Inv. 13529) has a tablet-woven border on the semicircular sides and the straight top edge. On the curved edge of the mantle, a small fragment of the border without the outside edge is preserved. The surviving part of the border consisting of 18 tablets, which has a triangular pattern, demonstrates that the border went all the way around the mantle. Furthermore, another fragment belonging to this curved side of the mantle was found and it is well preserved in its full width and has a triangular pattern (Fig. 11.4). The border of the straight edge of the mantle was made using 35 tablets. The innermost tablet forms a stripe and apparently was threaded with a thicker yarn than the rest of the border. This tablet is followed by 17 tablets forming a triangular pattern and 17 tablets forming stripes. No differences are seen in the yarn of these 34 tablets as one could expect if the pattern originally was woven using different colours. The warp threads are 2-ply. The preserved border is now between 2.3 and 2.8 cm wide. The warp count is 52–60 threads/cm, which corresponds to 13–15 tablets/cm; the weft count is about 19 wefts/cm. On the preserved borders there are no changes in the turning direction of the tablets. The thicker threads in the innermost tablet could have been of a different colour. The tablets have been threaded from different directions according to the desired pattern (Fig. 11.5). The triangular pattern is produced with tablets 2–18, the turning direction of which is changed one at a time, as in Mantle 1. Where a change of turning direction has occurred, the weft is seen above the warp threads for a short distance. This detail makes the triangular pattern more visible, although it is more evident on one side of the border.

The Tablet-Woven Borders of Garment (Inv. 13530)

Garment 3 has rounded edges along which are preserved many fragments of a tablet-woven border. It is a simple border consisting of 13 tablets, which are threaded in opposing pairs and all are turned in the same direction (Fig. 11.6). The width of the band varies between 8



and 10 mm. The thread count of the border is about 12 tablets or 48 threads/cm in warp and 18 threads/cm in weft. The warp consists of alternating s- and z-twisted threads. The fact that the threads are not plied is remarkable, because single threads tend to untwist when used for tablet weaving. To avoid this problem, the tablets must be turned in the same direction as the twist direction of the yarn throughout the entire weave. Hence, the weaver must choose s- or z-twisted yarn according to the twist direction of the warp cord in the tablet weave. Only one error has been detected in this border: one tablet has been twisted in the wrong direction for some 5–10 cm. It is not possible to find any changes in the turning direction of the tablets. The fringes of the twill fabric are, as seen on Mantle 1, used as wefts in the tablet-woven border and cut at the nexus between fabric and border.

Verucchio Tomb B/1971

Two garments from Verucchio Tomb B/1971 have also preserved tablet-woven borders (von Eles 2006). Object A, a possible tunic with rounded lower edges and straight and open side edges, has fragments of tablet-woven borders preserved along three of the four edges. In the middle of the garment, two fragments of a tablet border have been noted, supposedly the edging of a neck opening. All tablet weaves appear to be woven using single threads and using the fringes of the fabric as wefts of the border. Usually, two threads are used as wefts in each shed and they return back in the next shed. All tablets are arranged in opposed pairs

and are turned forward. The twist direction of the threads of one tablet follows the twist direction of the tablet (see Fig. 11.6).

The two fragments of border at the neck opening are both preserved in full width, and were made using 17 tablets. One of these fragments is quite remarkable since it has a lump of threads and some irregularities, which demonstrate that this must be the starting point of the border (Fig. 11.7). The lump is possibly the point where the thread ends were secured and the starting of the border, where little eyelets of the first turn of the tablets



Fig. 11.5. (left) Mantle 2: The connection between the border and fabric on the straight edge of the mantle from Tomb 89, Verucchio. Close to the twill fabric there is one tablet which is turned the same way, followed by 17 tablets which create a triangular pattern by changing the turning direction of the tablets one at a time, and 17 tablets forming stripes of three tablets turned in opposite directions. (Drawing: L. Ræder Knudsen).

Fig. 11.6. Tablet-woven border of garment 3 (Photo: L. Ræder Knudsen).

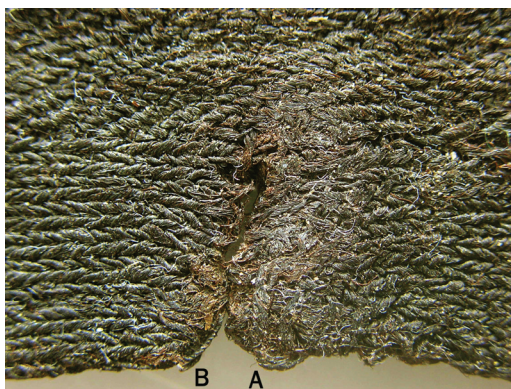


Fig. 11.7. Tablet-woven border of object A woven around the neck opening. The slit of the band possibly represents the starting point of the border (B) and the finishing point of the border, where the threads are secured by sewing (A) (Photo: L. Ræder Knudsen).



Fig. 11.8. Remains of a tablet-woven border of two colours are preserved at the lower front part of object B. The pattern is made of rows of tablets twisted in different directions (Photo: L. Ræder Knudsen).

are left. This interpretation is supported by the fact that the starting point has a small weaving fault (one tablet turning in the wrong direction) which is corrected after a few centimetres. If this irregularity in fact is the starting point of the tablet weave, it gives a good indication that the neck opening was square-cut with rounded corners. Otherwise it would not have been necessary to make the starting point of the tablet weave inside the neck opening. Rather, it would have been easier to start the border at the corner where the cut of the neck opening and its edges would have met each other to avoid the lumpy area where starting point and finishing point of the tablet weave meet.

One lower curved edge of the garment has a border of 13 alternately opposed tablets with the outer edge preserved. The tablets are turned forward where the border can be followed. This edge is presumably the back one, as the starting point of the tablet weave then would be at the back of the neck opening and less visible. This at least would be the choice of a modern weaver.

At the other curved edge, a small fragment of the tablet border with three tablets is preserved, but its outer edge is no longer present. At one of the straight edges, a tablet border of at least 10 tablets is preserved. We have thus reason to believe that this garment had tablet-woven borders on all edges, as well as around the neck opening.

Object B is presumably a garment of the same shape as Object A, but not as well preserved (Fig. 11.8). There are remains of a broad border along one curved lower edge, which must have been at least 2–3 cm wide. This border might have had a pattern. At the opposite curved edge, tiny fringes possibly indicate that it was edged by a border as well. Along the neck opening, a border of at least 7 tablets turned in different directions survived, but there are no remains of a border along the straight edge.

Characteristic Features of the Tablet-Weaving Technique in Verucchio

The tablet-woven borders of Verucchio are remarkable in terms of their technique considering their early date. Even though these are amongst the earliest securely identified

examples of tablet weaving, they already present many advanced technical characteristics. In the following, the special characteristics of the tablet-woven borders and tools possibly used for their manufacture are discussed.

Starting Borders

In a warp-weighted loom, a starting border is often used to prepare the warp and, in prehistoric times, such starting borders were sometimes tablet woven. In the process, the weft threads of the tablet weave are drawn out to such an extent on one edge as to serve as warp threads on the loom. The *tintinnabulum* from Arsenale Militare in Bologna (see Fig. 9.16 in Gleba in this volume), dated to the 7th century BC, may in fact represent the scene of making the warp for an upright loom. The tablet weave serves as a tight band which can be used to fasten the warp to the loom; it is also useful to maintain an even spacing of the warp threads and keep them from getting mixed up on the loom. On a finished cloth it is sometimes possible to identify a starting border, as the weft threads of the tablet weave (which are the warp threads of the ground weave) go through the shed in pairs and are not cut.

The Verucchio mantles were probably woven on a vertical loom. The warp could have been made using a tablet-woven band as a starting border, but no starting border has been identified in the Verucchio material so far.

Selvedges

Selvedges can also be tablet-woven. Often they are made only using a few tablets and woven simultaneously with the textile, but sometimes tablet-woven selvedges using more numerous tablets are seen. It is very difficult to make such edge borders simultaneously with the weave as the thickness of the tablets requires a certain amount of space. Furthermore, the borders and the textile require different tension. Both the mantles from Verucchio Tomb 89 have curved edges with tablet-woven borders. Such borders could not be woven simultaneously with the cloth. The only way this can be achieved is by using the fringes of a finished textile as wefts in the tablet-woven border as described above. In order to use this method, it is necessary to cut or weave the textile to shape, leaving threads long enough to make the fringes. The border can be woven either on a horizontal tablet loom placed, for example, on a table, or by using a

tablet loom hanging vertically from a loom or ceiling.

The straight edge and hence the tablet-woven border of Mantle 2 is more than 280 cm long and, along it, the tablets without pattern were turned in one direction only. Changing the turning direction will always make a 'scar' across the tablet weave disturbing its regular appearance. Bands bearing evidence of the weaver trying to avoid or minimise the visible signs of changing the turning direction of the tablets are known from other archaeological contexts (Raknes Pedersen 1988, 117; Berlin Englund 1994, 25 and 42), but usually the weaver accepts changes in turning direction as a necessity. Not changing the turning direction of the tablets is very difficult, as the warp will progressively be twisted harder behind the tablets until it is impossible to move the tablets anymore (see Fig. 11.1). Usually, it is possible to weave about 20–30 cm of the band turning the tablets in the same direction before it is necessary to change the turning direction or do something to untwist the warp. It appears that the weaver who made the Verucchio mantle borders preferred to do extra work untwisting the warp in order to make the mantle as beautiful as possible. As the 'scar' resulting from a change of turning direction will only be seen by a trained eye, it is likely that the mantle was meant to be used by a person who was acquainted with the details of the weaving process, or alternatively that the quality of the weave had to be perfect for other, possibly religious reasons. This also means that time was not of the essence in this case.

Other Evidence of Tablet Weaving

Various kinds of tablet-weaving equipment can be found amongst Early Iron Age archaeological material recovered in Italy, including tablets, spools, spacers, clasps and beaters.

Tablets

Tablets, having been made of wood, bone or hardened leather, rarely survive. They are also not always properly identified. Recently, tablets from two sites in Italy have been published. At Ficana, near Rome, an almost complete small bone tablet, measuring 2×2 cm (Fig. 11.9a), was found in a context of the late 8th century BC (Lipponen 2007, 4). Other important finds are from Longola di Poggiomarino, an Iron

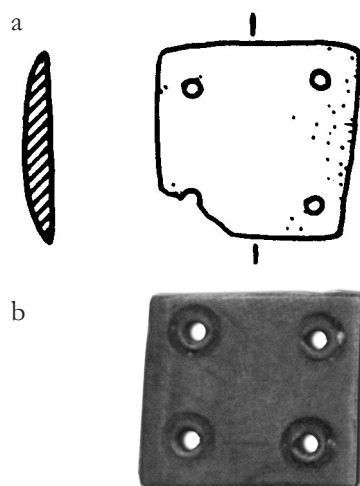


Fig. 11.9. Weaving tablets: a) from Ficana, 8th century BC (Courtesy of Eero Jarva); b) from Longola di Poggiomarino, 9th century BC (After Pizzano 2005, Fig. 16).

Age settlement located north-east of Pompeii. Here, among the objects in organic materials preserved in unusual waterlogged conditions, there are small tablets, also approximately 2×2 cm in size (Fig. 11.9b), in both wood and bone (Pizzano 2005, fig. 16). Other examples of tablets are noted in Tomb 309 at Aliano-Cazzaiola in South Italy (Russo 2006, 144 note 65). Such very small tablets have been demonstrated to be particularly useful for weaving tablet borders next to the vertically hanging ground weave (Ræder Knudsen 2010).

Spools

Spools (Italian *rocchetti*) are small cylindrical objects, often with concave shaft and flaring ends (Fig. 11.10). They are made of terracotta and range in length between 3 and 10 cm. Spools (sometimes also called bobbins in the archaeological literature) in Italy date since the end of the Bronze Age and have been found both on settlements and in graves. Many of the Early Iron Age burials of Central and North Italy contain multiple spools (Ræder Knudsen 2002; Gleba 2008, 140–150). Although other interpretations of their use have been suggested, it is most likely that they could have been utilised as weights for the sets of threads passing through the tablets used for making the tablet borders such as those on the Verucchio textiles. To keep the warp threads of the tablet weave taut while weaving, something heavy must be tied to the end of the warp. The weight of the spools varies between 5 and 100 g, with many having a weight of around 20–30 g and 35–45 g. While such a light weight would hardly



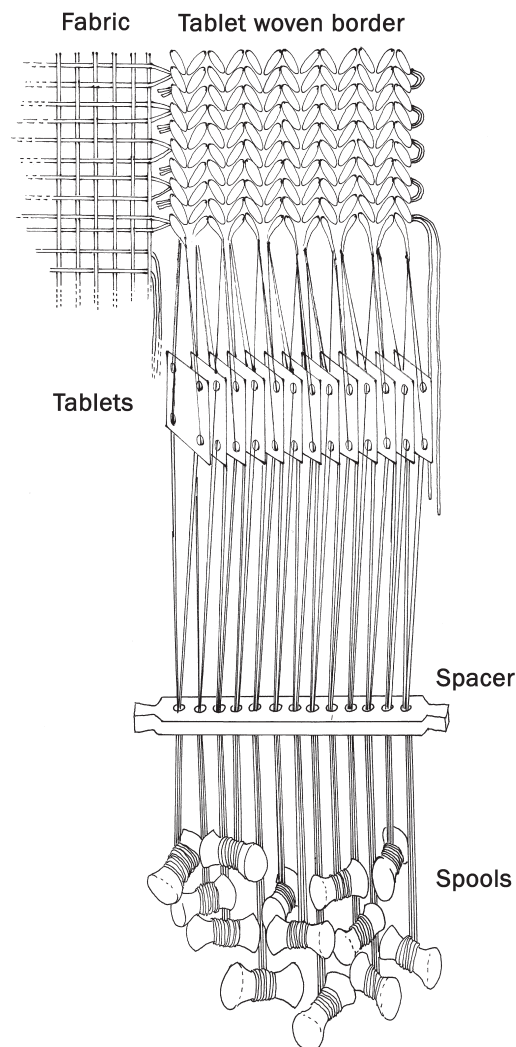
Fig. 11.10. (above)
Spools found in a female
grave in Verucchio
(Photo: L. Ræder
Knudsen).

Fig. 11.11. (right)
Interpretation of the
weaving method for
tablet-woven borders on
garments from Verucchio.
The twill fabric is woven
first presumably on a
vertical loom. Afterwards,
the borders are woven
to the edge of the fabric
using the excess fringes as
weft (Drawing: L. Ræder
Knudsen).

be useful on a warp-weighted loom, each spool provides the optimal amount of tension for four threads passing through a tablet. The four threads from one tablet will need one spool, and depending on the thickness of the yarn, spools of different weight would be needed. The concave shaft allows the warp of the tablet weave to be wound on the spool. Using only one spool per tablet will also allow the spool to rotate and untwist the warp beyond the tablets (Fig. 11.11).

Spacers

Other objects possibly related to tablet weaving are spacers (Ræder Knudsen 2002; Gleba 2008, 152–153). A spacer (*distanziatore*) is usually a small, narrow, bone piece with a rectangular section, numerous holes along its length and, sometimes, narrowing at each end, as if it is meant to be inserted or fixed somewhere (see Fig. 11.11). Thus, in Verucchio tombs 55 and 102 (Fig. 11.14 top centre), three such bone tools have been found, one complete, three fragments of a nearly complete tool and a single fragment of another (Ræder Knudsen 2002, 229). The complete tool has 11 holes; the three fragments have at least 15 holes. The likely interpretation of the function of this implement is that it was used to maintain a distance between the warp threads in order to avoid entanglement. Given its length, it may



have been used in tablet-weaving: threads of one tablet would pass through one hole of a spacer and subsequently be wound on a single spool. This may be what the horizontal stripes at the end of the warp represent in the weaving scene of the Verucchio throne (Fig. 11.12; also see Fig. 9.15 in Gleba in this volume).

Clasps

The use of another metal implement, a clasp (*forcella da telaio*), is uncertain but may also be related to tablet weaving. It consists of two long, thin, rectangular pieces of bronze, fixed together with a rivet on one end and fastened together with a clasp on the other, and ending in thin coiling strips, sometimes with short chains attached (Ræder Knudsen 2002, 241). Only one of the extant implements has a clasp preserved. Examples come from burials at Marsiliana

d'Albegna and Vetulonia, Vulci, Veio, Bisenzio, Civita Castellana, Narce, Nazzano, Capena and Capua (Gleba 2008, 151). All items are dated to the 8th–7th centuries BC. Their use for textile activities was deduced from the fact that the Civita Castellana example had textile remains between the two bronze plates (Barnabei and Pasqui 1894, 390, Fig. 180).

Textile traces were noted inside the implements from the Quattro Fontanili Tomb YZ5 at Veii. Such instruments could have been practical for keeping a narrow band in place during weaving (Fig. 11.13). In the process, the coiling ends function to fix a string which goes around the weaver's waist, while the finished end of the tablet-woven band is held firmly between the two rectangular plaques, which keep it taut and prevent twisting. The weaver, thus, has both hands free to rotate the tablets and pass the weft back and forth. Grave goods assemblages with clasps have, in some cases, also contained spools. Similar instruments, made in wood or metal, were used until recently in North Africa. It is likely that, in ancient Italy, these implements were usually made of wood or bone and hence did not survive.

Beaters

Fragments of another type of bone tool have been found in tombs 55 and 102/1972 Lippi (Ræder Knudsen 2002, 229). It is shaped like a knife, but the edge is not very sharp (Fig. 11.14 bottom left). Neither extant tool is complete, so the original shape is not known. Nevertheless, they seem to be similar to small weaving swords, equipment essential for beating up the weft in a tablet-woven border. The cross section of both tools shows one rounded and one sharp edge – a shape very useful for beating up the weft quite hard, as would have been necessary for the borders of the Verucchio mantles.

Conclusions

The tablet weaves of the Verucchio finds are all made as borders. The fringes remaining from the weave are used as wefts in the borders. The borders follow both straight and curved outer edges of the garments as well as the inner edges such as the neck openings. Their purpose may have been to secure the edges as well as to make decorative borders which were emphasised by the use of different colours

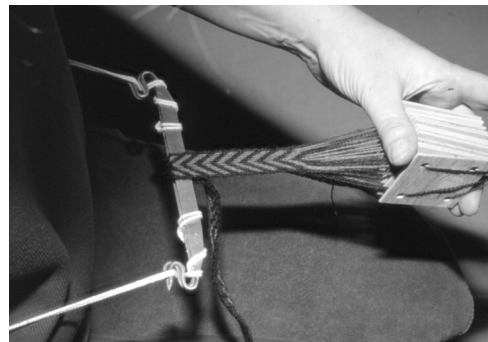
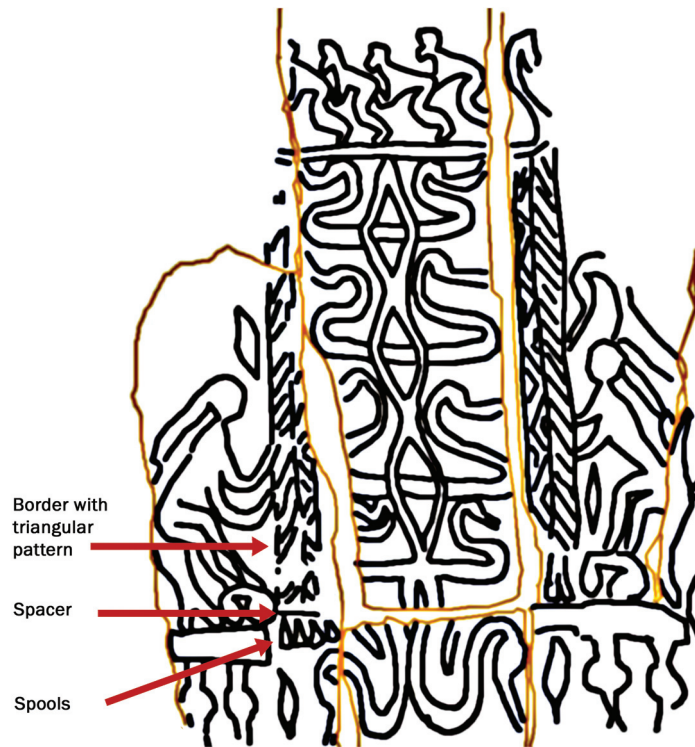


Fig. 11.12. (above) Weaving scene carved in wood from the throne of grave 89, Verucchio. The scene may depict women making tablet-woven borders on a textile using spacer and spools (Drawing: L. Ræder Knudsen after von Eles 2002).

in the fabrics and the borders. Tablet-woven starting borders have not been identified in the Verucchio material.

The mantles from Verucchio Tomb 89 have tablet-woven borders preserved on all sides. The edges of the mantles were produced using plied threads. The borders show a pattern of triangles and stripes made by changing the turning direction of the tablets one by one. In contrast, Garment 3 has a simpler border made of single yarns. The twist direction of the threads of one tablet corresponds to the turning direction of the tablet. This is noteworthy, because using single yarn in a tablet weave can be complicated as single threads will untwist themselves if turned for

Fig. 11.13. Work in progress on a modern tablet-woven band. To fasten the woven band in front of the weaver, a copy of an object found at Veio is used. The bronze clasp is very useful and functions even better than modern clasps used for tablet weaving (Photo: L. Ræder Knudsen).

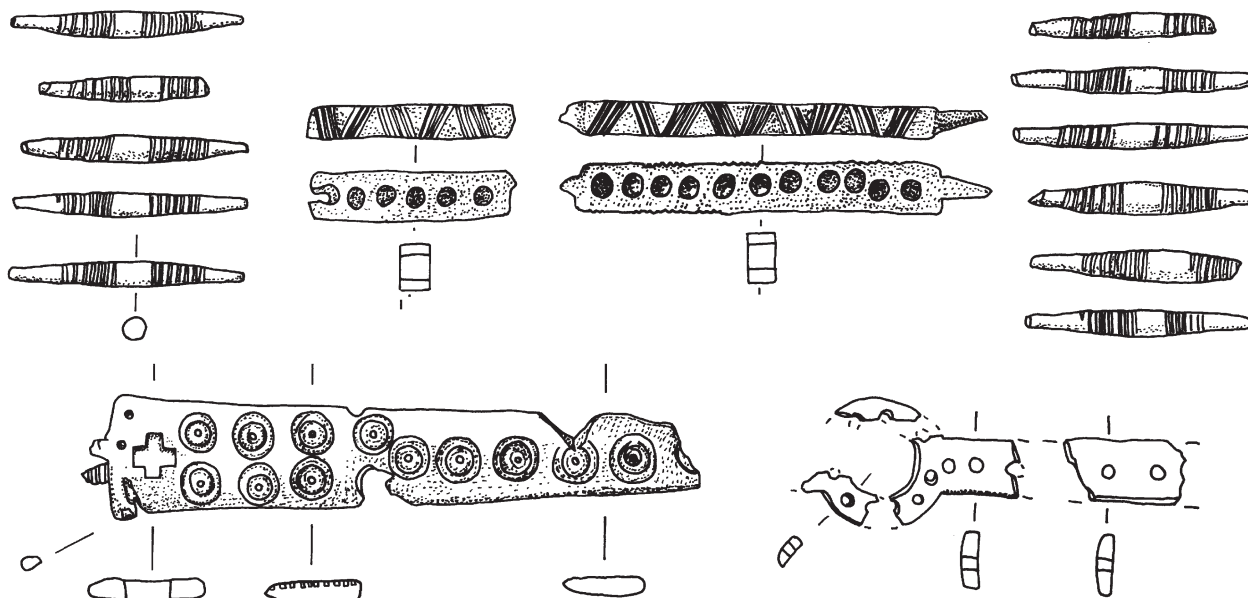


Fig. 11.14. Tools made of bone from Tomb 102/1972 Lippi. The knife-shaped tool could be used as a beater for making tablet-woven borders. The little hook at the left end of the tool would be useful to pass the thread through the shed of the tablet loom (Drawing: Courtesy of P. von Eles).

a long time in the opposite direction. This characteristic is also present in the mantles, but as the tablet-woven borders here are produced using plied threads, there was no practical need for using yarn with a specific twist direction. Nevertheless, when the twist direction of the yarn corresponds to the turning direction of the tablets, the border acquires a more homogeneous appearance.

The neck opening of object A from Tomb B/1971 has a small border, which seems to have the starting and ending point of the tablet weave preserved. This could be an indication that the neck opening was made as a continuous circle, without a vertical slit in the front.

The borders of the Verucchio textiles are among the earliest tablet weaves found in Europe. In spite of this, they have many advanced technical details, which reveal the weaving process and the intention behind it. Great effort was put into making these borders as even and as high quality as possible, and special tools were used for this work, including spools which are frequent finds in Early Iron Age burials in Italy.

The tablet weaves of Verucchio are, however, not unique. At Sasso di Furbara in Lazio, a boat burial dated to the 8th century BC contained nearly 100 textile fragments, among which was a fine cloth with a spin pattern and tablet-woven borders (Masurel and Mamez

1992). Tablet weaving is also often seen among the textile fragments from the Hallstatt cultural zone. In Western Europe (France and Western Germany), 7.5 % of the textile fragments found in 49 graves were tablet-woven, while during the same period in Central Europe (Austria, Czech Republic, Hungary, Switzerland), 2 % of the textiles found in 85 graves contained tablet weaves (Bender Jørgensen 1992, 123). Among the earliest and better known examples are the tablet-woven bands and borders from the Austrian salt mines in Hallstatt (*cf.* Grömer in this volume), the princely burial at Eberdingen-Hochdorf (Banck-Burgess 1999, 72, 80–82 and this volume) and the princely burial at Apremont, France (Masurel 1990). Fragments of tablet-woven borders are also known from El Cigarralejo, Spain, dated 400–375 BC (Hundt 1968; *cf.* Alfaro in this volume).

Evidence for the making of tablet-woven borders may be present on the famous wooden throne from Verucchio Tomb 89, which is carved with decorative scenes, including two depicting weaving (see Fig. 9.15 in Gleba in this volume). In each scene, two women are seated on chairs placed on a high platform and are working on each side of a loom. They are either weaving a long narrow textile or making a border on each side of a large textile. The pattern of the border has a close resemblance to the patterns seen on the borders of Mantles 1 and 2 (see Fig. 11.2), consisting of triangles

and stripes. The analysis of the tablet weaves and textiles from Tomb 89 (*cf.* Stauffer in this volume) suggests that the long sides of the mantles represent the weft and short sides the warp. If that is the case, the scenes depicted on the Verucchio Throne do not represent the weaving of a mantle; rather, they show the making of the borders. The woven cloth appears to be attached to a beam with each end resembling the head of a bird. There is no indication of a roller beam on which the cloth could be wound up. This could be the reason why the weavers need a platform to reach the top of the loom. Another reason could be that, in order to make the borders without changes in the turning direction of the tablets, it was necessary to let the warp of the tablet weave hang in full length. If spools were used as weights for the tablet weaving, they would make the warp untwist itself, hence allowing the continuous turning of the tablets in the same direction. The round objects at the bottom may in fact represent the spools. Above them, at the end of the woven borders are depicted stripes across the warp threads, which may be the above-described spacers used to keep the warp threads organised.

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LATVIA

Early Neolithic	4500–3300 BC
Middle Neolithic	3300–2400 BC
Late Neolithic	2400–1500 BC
Bronze Age	1500–500 BC
Earliest Iron Age	500–1 BC
Early Iron Age	AD 1–400
Middle Iron Age	AD 400–800
Late Iron Age	AD 800–1200

LATVIA



Map 12.1. Latvia. Sites mentioned in Chapter 12.

Latvia

Irita Žeiere

Introduction

The earliest fragments of woven cloth in Latvia are from the 2nd to 4th centuries AD. However, various materials discovered indicate the use of fibre materials since Neolithic times on Latvian territory. Those materials include small fragments of fibre or their impressions, as well as various tools used for the preparation and making of textile materials, such as swingles, spindle whorls and needles, as well as ornaments like pins and buttons, which serve as evidence for the use of specific types of clothing.

Chronological and Cultural Background

The earliest evidence indicating the use of fibre materials for various purposes in Latvia dates back to the Neolithic period (4500–1500 BC). This period is documented by 57 Neolithic settlement sites in the eastern, western and central parts of Latvia, as well as two Neolithic cemeteries and the burial grounds that were incorporated into the territories of the settlements.

In the East Baltic region, the beginning of the Neolithic is defined by the appearance

of pottery rather than by the beginning of farming as in southern Europe. For this reason, the Neolithic of this region is also known as the Forest Neolithic (*Latvijas senākā vēsture* 2001, 75). The process of neolithisation, when the hunter-gatherer economies gradually developed into the agricultural economy, is connected to the East Baltic culture. The Neolithic is divided into three phases – Early, Middle and Late Neolithic (*Latvijas senākā vēsture* 2001, 75).

The beginning of the Early Neolithic (4500–3300 BC) in Latvia is considered to be the middle of the 5th millennium BC when the first examples of pottery appear. The hunting and fishing gear, as well as the oldest clay vessels found in the territory of Latvia belong to the Narva culture area, with several local variations, including Osa and Sārnate pottery types.

The beginning of the Middle Neolithic (3300–2400 BC) is marked by the arrival of new peoples into the territory of Latvia. Two different cultures can be recognised: the new Comb Ware culture and the East Baltic culture. The beginnings of farming are attributed to this period; however, the hunter-gatherer economy still prevailed in the territory of Latvia (*Latvijas*

senākā vēsture 2001, 79, 82). The most important settlements of this period that have been investigated are located on the shores of Lake Lubāns, Lake Burtnieku and Great Lake Ludza in the eastern part of Latvia, as well as in the Sārnate bog in the north-western part of the Latvian littoral lowland.

The Late Neolithic period (2400–1500 BC) is characterised by the use of new methods in working stone, pottery and amber. The centres of amber working were involved in the development of a new trading system directed towards the south-east. During this period, a new ideology was formed based on the calendar cycle (*Latvijas senākā vēsture* 2001, 115). During the Late Neolithic, the territory of Latvia was inhabited by the representatives of Corded Ware and Boat Axe cultures who arrived in the Baltic area at the turn of the 2nd millennium BC and created a local Eastern Latvian variant of the culture in the lowland of Lake Lubāns (*Latvijas senākā vēsture* 2001, 91). The local corded pottery was created by impressing cords over the entire surface of vessels, as well as with comb impressions and excised ornaments (*Latvijas senākā vēsture* 2001, 115). In this period the first bone pins of the early type appeared.

The period from 1500 till 500 BC in Latvia is called the Bronze Age since during this period people became familiar with bronze through exchange with other cultures, and they learned how to work it and also began to use it (*Latvijas senākā vēsture* 2001, 117). The transition to the Early Bronze Age was marked by changes both in the material culture and the economic and social organisation (*Latvijas senākā vēsture* 2001, 95). In the East Baltic area, including the territory of Latvia, there were no copper and tin deposits necessary for the production of bronze, and the weapons, tools, ornaments and other objects were crafted mostly of locally available materials: stone, horn, bone and amber. At the turn of the 1st millennium BC, two ethnic groups, each defined by its own characteristic material culture, can be recognised. The scratched pottery was characteristic for the Balts, while the textile-impressed pottery was characteristic for the Finns, with the distribution of each pottery type clearly delineating the areas inhabited by each culture (*Latvijas senākā vēsture* 2001, 183, Fig. 137).

The period between c. 500 BC, when the

first iron objects appear in Latvia, and until the 1st century AD, when iron began to be obtained from the local bog ore, is commonly referred to as the Earliest Iron Age, which is equivalent to the North European Pre-Roman Iron Age. During this period, metal played only a minor role in the economy and daily lives of people because of the lack of the raw materials necessary for its production. In fact, the Bronze Age and the Earliest Iron Age in Latvia are generally combined into the Early Metal Period (*Latvijas senākā vēsture* 2001, 117). During this period, stock-keeping and agriculture became increasingly important. Alongside the ordinary settlements, there appeared fortified habitations, hill forts. The most extensive investigations of the ancient hill forts have been carried out at Vīnakaļns, Ķivutkaļns, Brikūļi, Kļāņģukaļns and other sites.

With the beginning of the Common Era, changes began to occur in the socio-economic and cultural life of the inhabitants of the territory of Latvia, triggered by the new technology of iron smelting from bog ore, which signaled the onset of the Iron Age in Latvia. This period is divided into three parts: the Early Iron Age (AD 1–400), the Middle Iron Age (AD 400–800) and the Late Iron Age (AD 800–1200).

During the Early Iron Age, economic activity previously restricted to hill forts, expanded to open settlements. New settlements appeared in previously sparsely inhabited areas, thus spreading the population over the entire territory of Latvia. Agriculture became increasingly important with the use of iron tools, altering the surrounding landscape. Arable land became the property of a few selected families, creating changes in the structure of the society (*Latvijas senākā vēsture* 2001, 205). The introduction of a field system had a positive impact on the development of animal farming, demonstrated by the increasing number of livestock bones found in the cultural layers of the investigated settlements. The use of sheep wool in the preparation of clothing also increased, as attested not only by the finds of wool materials but also by the appearance of spindle whorls in female burials of this period. In one of the female burials in the Gailīši cemetery in Īle parish, sheep shears were also found. The lack of loom weight finds suggests that weaving was done on looms without weights.



Fig. 12.1. Cord impressions on pottery from the Abora I settlement (After Dumpe 2006, Fig. 3:2).



Fig. 12.2. Cord impressions on pottery from the Abora I settlement (After Dumpe 2006, Fig. 4:5).



Fig. 12.3. Twisted cord fragments from the Sārņate settlement (Photo: R. Kaniņš).



Fig. 12.4. Remains of a net from the Sārņate settlement (Photo: R. Kaniņš).

Trade and exchange flourished during this period, especially between southern and western regions, thus encouraging further cultural development. Gradually, there appeared larger areas whose inhabitants had economic, family, religious and political connections in common, traceable in the ornamental motifs, tools, pottery and burial traditions (*Latvijas senākā vēsture* 2001, 214). These processes occurred over the entire 1st millennium AD and were greatly influenced by the impulses coming from the south and the territory of Lithuania (Vasks *et al.* 1997, 129). Eight different cultural regions can be recognised, none of which can be strictly attributed to the territory of Latvia (Vasks *et al.* 1997, Fig. 52). More broadly, two very different zones can be discerned: the southern part of Latvia inhabited by the Baltic tribes, and the northern area of Latvia where Baltic Finns were present (Vasks *et al.* 1997, 129).

Neolithic and Early Metal Period

The earliest evidence of the use and production of textile materials in Latvia was found in the settlements of the Middle Neolithic. It consists of the archaeobotanical remains of various cultivated plants, including hemp. In the same settlements, swingles (instruments for flax beating) have also been found, which were used for the preparation of hemp and other plant fibres (*Latvijas senākā vēsture* 2001, 85). Furthermore, the presence of sheep bones suggests that wool was possibly already used (*Latvijas senākā vēsture* 2001, 99). Spindle



Fig. 12.5. Textile traces on the weapons from a La Tène period hoard found at Bēne, district Jelgava: a) the weapons; b) close-up of the mineralised textile (Photo: R. Kaniņš).

whorls found on the settlements of the Late Neolithic indirectly attest that fibre was spun. These spindle whorls were made of rounded potsherds with a hole drilled in the middle (Dumpe 2006, 81).

More direct evidence of the use of textile materials was found on clay vessels: in many cases, their surfaces preserve textile imprints, on the basis of which it has been suggested that different fabrics, including tablet-woven bands and sprang nets were used in the production of the vessels. However, while investigating the pottery of the Late Neolithic, Baiba Dumpe concluded that not a single sample of the Late Neolithic pottery found in the territory of Latvia has impressions of true textiles or sprang nets (Dumpe 2006, 78). Dumpe also studied the production technology and the surface texture of the pottery by carrying out a series of experiments on reconstructing the pottery finds of the Abora I settlement. The experiments have demonstrated that the use of woven cloth and tablet-woven bands in the production of clay vessels is not likely and does not create the depth of texture characteristic



Fig. 12.6 Fragments of a 2/2 twill from Slate, barrow group No. 1, grave Nr. 3 (Photo: R. Kaniņš).



Fig. 12.7. The fragment of a wool tabby from Gailiši barrow group No. 1, grave D (Photo: R. Kaniņš).



Fig. 12.8. The fragment of a wool braid in two colours from Gailiši barrow group No. 1, grave F (Photo: R. Kaniņš).

of the surface of this type of pottery (Dumpe 2003, 110; 2006, 79). It was also proven that it is possible to obtain the surface texture of all-over cord impressed ware with a cord that is wrapped around a rod and pressed onto the surface of the vessel in different directions (Fig. 12.1; Dumpe 2005). This process was used not only during the last stages of the preparation of the vessel, but also during the entire process (Dumpe 2003, 116). The impressions found on the ceramic sherds of the Abora I settlement show that cords of different thickness, varying from 1 to 1.5 mm in diameter were used (Fig. 12.2). In most cases, the cords were s-twisted, resulting in z-twisted impressions. Only in very rare cases have threads twisted in the opposite direction been found (Dumpe 2003, 110). Changing the thickness of the cord and the density of the wrapping resulted in different textures for the imprints. Different textures on pottery can also be obtained using braided or knotted cords. Thus, the different pottery textures of the Neolithic reveal not only the skills of cord-making but also the development of several different textile techniques, which serves as evidence of the increasing variety of textile materials and their increasing importance during this period (Dumpe 2006, 82).

There is no direct evidence of shearing and spinning of wool in the finds of the Early Metal Period, but sheep bone assemblages discovered in the settlements indicate that sheep were kept mainly for wool. A large number of bone pins have been found on the archaeological sites of this period attesting their use for the fastening of woven garments. In the burial ground of Doles Ķivutkalns, bone pins were found in more than 50 burials, located in the chest area or close to the neck of the deceased. They were placed diagonally and could have held together a cape-like piece of cloth. In the nearby Doles Ķivutkalns settlement, more than 400 pins were discovered (*Latvijas senākā vēsture* 2001, 167), some of which were without doubt made to imitate bronze pins. Some of the amber buttons are similar to the bronze buttons of the same period found in Denmark and Sweden (*Latvijas senākā vēsture* 2001, 167).

The evidence for the actual textiles in this early period consists of threads or ropes made of plant or animal fibres. No detailed investigation of these fibre materials has been

carried out so far, therefore it is not possible to determine precisely how many finds have been preserved and which materials were used in the process of their preparation. Valdis Bērziņš has collected and investigated the fibre materials found at Sārņate, a Neolithic settlement located in the western part of the territory of Latvia in a bog of coastal lowland (Bērziņš 2008, 221–273). Here, more than 30 items of fishing equipment were found, which included fibre materials (Vankina 1970). In some cases, bast fibres were found on sinkers, which consisted of stones with holes through which the cord passed. In some cases, pebbles used as weights were covered in birch bark and then wrapped with cords. The surfaces of the sinkers were covered with cross wrapping in several layers. In 12 cases, fishing bobbers made of pine bark were found containing remains of cord. Various fibre materials were also used for eel clamps and the preparation of lath screens from splinters (Bērziņš 2006, 49–58, Figs 3, 5). They were connected using unspun fibres and also with fibres plied into cords. The cords were twisted from two bast bundles. Both S- and Z-plied cords have been recovered. In one of the dwellings, fragments of fishing nets and ropes were encountered next to fishing-net weights and bobbers (Figs 12.3–12.4). The fishing net was made of 1–1.5 mm thick plied bast cord. The knots found in these samples suggest that it was a knotted fishing net; however, the samples were so poorly preserved that it is not possible to obtain more detailed information about the technique. There is evidence of similar fragments of fibre materials from other Neolithic settlements. For example, in Dviete, a wrapping of twisted cord was found on a bone fishing hook, while a small basket found in the Abora I settlement was made of willow branches woven together with bast cord. Comparisons, in particular to nets, can also be made with contemporary finds from Lithuania (Rimantienė 1980).

The oldest known example of the woven fabric comes from La Tène period and was found in Bēne in the district of Jelgava. The impressions of the fabric have been preserved in a corrosion layer on several metal weapons that were wrapped in the fabric (Fig. 12.5). They are considered to be a hoard. The fabric woven in plain weave using unevenly z-twisted threads was most probably made of wool. This

conclusion is based on the microscopic analysis and the chemical tests, however, additional research will be necessary for more precise identification. The density of the fabric is 5/6 threads/cm.

Early Iron Age

The earliest organically preserved woven textile finds in Latvia date to the 2nd–4th centuries AD. Due to the increased number of iron tools and weapons as well as bronze ornaments placed in the graves, textiles from this period are preserved in contact with metal. Textile remains from clothing found in male and female burials are very small and fragile or consist only of a few threads preserved on metal objects such as brooches, pins, armbands or neck-rings. Some of the textiles have only survived as impressions on the corrosion product layers of iron or bronze. Due to their small size, these fragments cannot be used to characterise the clothing itself. However, the position of the pins in the burials – one or two parallel pins used in the chest or waist area – suggests the existence of cape-like garments.

Textile materials from seven sites in the western (Zante), south-western (Gailīši, Mazkatuži) and south-eastern (Boķi, Melderišķi, Razbuki, Slate) parts of Latvia are attributed to the Early Iron Age. The excavations of these sites were carried out in the late 19th–early 20th centuries and only a part of the textile finds was preserved after publication (Hausman 1892, 69, 71, Fig. 8, 18; Moora 1938, 574; Zariņa 1990, 107).

At least 32 textile finds are known from the Early Iron Age, among which are fragments of woven materials and single threads. Only part of this corpus, about 20 finds, survive today. Fortunately, some of the textile finds were investigated and described immediately after they were found, although it is no longer possible to verify this data.

Samples of the organic materials and textiles found in the Mazkatuži burial ground in Rucava parish were analysed by K. R. Kupffer in 1925 (Kupffer 1928, 65–70). He carried out fibre analysis of the textile finds and concluded that the fabrics were made of local sheep wool, the fibre diameter being 50–165 microns. In several textile samples, Kupffer discovered light lambskin and sheepskin as well

as horsehair. In most cases, naturally light sheep wool was used, although occasionally naturally pigmented dark wool was also found. Textile fragments dyed blue-green were recovered (Kupffer 1928, 69–70). Traces of dark blue dye have also been found in the samples from other sites.

The textile finds from the Gailīši burial ground in Īle parish were investigated and described by ethnographer A. Birgel-Paele (Moora 1931, 459). Less is known about the oldest finds in Zante: only the sizes of the two textile finds and their pictures have been published (Hausmann 1892, 69, 71, Figs 8, 18), while the exact location of where they were found is still unknown. In several cases, textile materials adhering to the metal objects were destroyed during conservation. Thus, small textile fragments were observed on nine neck-rings found in the Gailīši burial ground (Moora 1931, 459), but none has survived.

Three of the preserved finds (Boķi, Razbuki, Melderišķi) are made of plant fibres. They consist of linen threads which were used for a spiral decoration of a cap and a necklace. The rest of the textile finds were made of sheep wool. Most of the textiles were woven in 2/2 twill (Fig. 12.6) and only two of the finds (Slate, Gailīši) were woven in tabby (Fig. 12.7). For all textiles single threads were used, twisted in both s and z directions. The diameter of those threads was mostly 0.5–1 mm, in rare cases 1.5–2 mm.

The textiles found in the western part of Latvia were both z/z and z/s twisted, but those found in the eastern part are mostly z/z-twisted, with only one exception (Slate), when the threads were s/s twisted. The density of the material varies; usually the number of threads is 2–4 threads higher in one direction, resulting in thread counts of 8/6, 10/8, 10/6 threads/cm, while in some cases the number of threads is even in both directions (9/9). One side of a textile fragment from Mazkatuži grave 24 was fulled. An interesting find has been preserved from the Gailīši burial ground No. 1 barrow group, grave F, where a 1.5 cm long and 3 mm wide fragment of a wool braid was found (Fig. 12.8). It was made of 8 threads separated into 4 groups of two different colours (blue and red), which were crossed one over the other. It is possible that the braid was used as a decorating element for clothing. Similar, but thicker, braids were

commonly used for decoration of 11th to 12th century AD Livonian costumes.

Conclusions

The investigation of the textile finds from Latvia from the Neolithic and the Early Metal Period shows that their number is very small. All the textile materials are made of plant fibres, but are poorly preserved and no scientific identification of these objects has been carried out to date. All these finds are related to the subsistence activities of people, such as fishing and pottery making, but no fragments of woven cloth have been discovered so far that would prove their use for clothing. However, the available materials indicate that people of this period were already familiar with several different textile techniques, such as spinning, twisting and plaiting.

Even though the number of textile materials in Latvia attributed to the Early Iron Age is small, and the size of the finds does not allow reconstructing the original garments they belonged to, they are very important as the earliest direct evidence of locally woven textiles. Finds from different parts of Latvia provide the opportunity for comparison and allow us to gain an insight into the types of textile materials used and their preparation. Hopefully, new finds will provide opportunities for more detailed analysis.

Original text translated from the Latvian by Zane Linde.

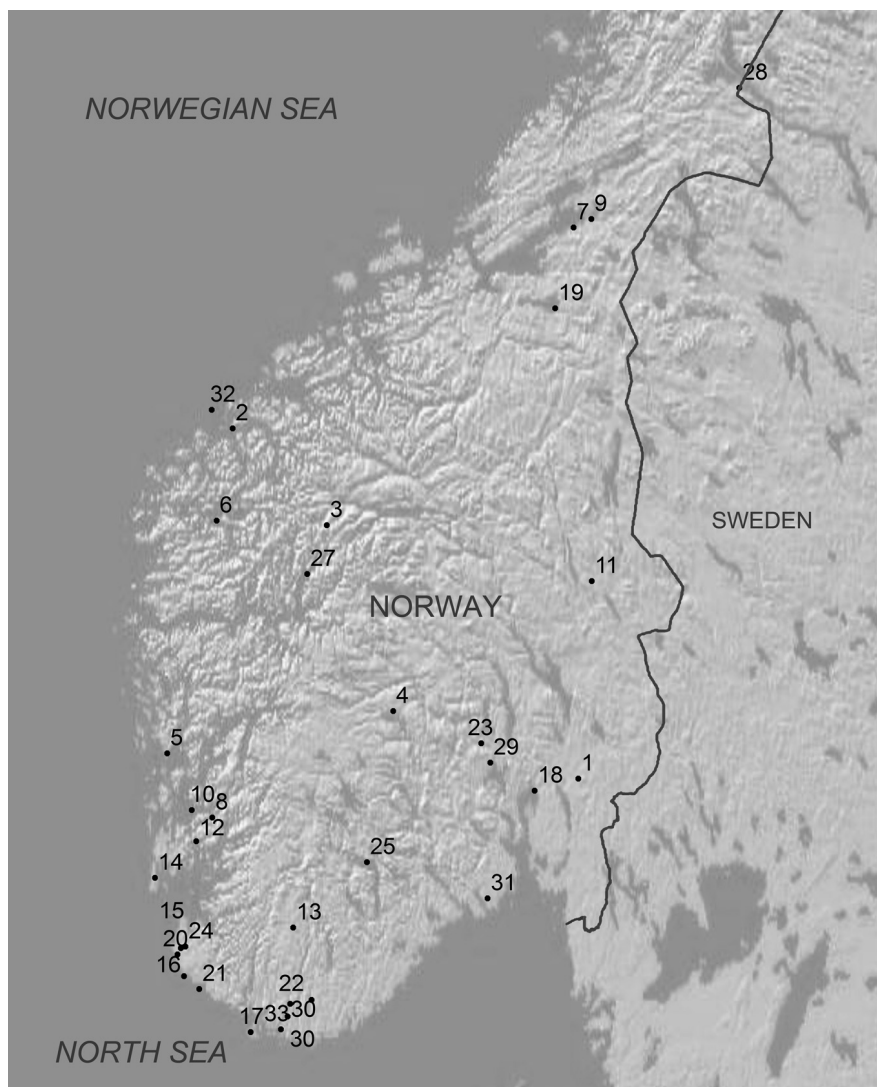
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NORWAY

Bronze Age	1800–1100 BC
Late Bronze Age	1100–500 BC
Early Iron Age	500 BC–AD 570
Pre-Roman Iron Age	500–1 BC
Roman Iron Age	AD 1–400
Migration period	AD 400–570

NORWAY



Map 13.1. Norway. Sites mentioned in Chapter 13:

1 Akershus	10 Halsnøy	19 Rønseberg	28 Viem
2 Blindheim	11 Hedmark	20 Sætrang	29 Veien
3 Breiheimen	12 Helgeland	21 Salte	30 Vemestad
4 Buskerud	13 Jæren	22 Seglheim	31 Vestrum
5 Døsen	14 Karmøy	23 Snartemo	32 Vigra
6 Evebø	15 Krosshaug	24 Tegle	33 Øvre Berge
7 Gjeite	16 Kvassheim	25 Telemark	
8 Haaland	17 Meberg	26 Trygslund	
9 Hallem	18 Oslo	27 Ugulen	

Norway

Sunniva Halvorsen

Introduction

Prehistoric textiles in Norway have been preserved in three ways: in their organic state, as textile impressions on metal or pottery, or in a mineralised state with organic structures replaced by metallic salts. Most of the Norwegian prehistoric textiles are preserved in their original organic state. From the total of 346 textile fragments catalogued by Lise Bender Jørgensen (1986), nine textiles are impressions left on metal, and nine are mineralised.

Apart from a small group of peat bog textile finds, the surviving textiles come primarily from graves. The variations in burial traditions affected the preservation of textiles. The graves discovered often reflect the use of textiles in the higher strata of society, rather than the population as a whole. Rich burials are both easier to discover as they might be marked with mounds or raised stones, and are also more likely to contain metal objects which help in textile preservation. Graves also hold another source of information on prehistoric clothing: belts, pins, and clasps found *in situ* can reveal how textiles were worn as clothing.

Textiles are usually not found in settlements, although there are some from the Late Iron

Age (Mortensen 1998). The unique bog finds of Tegle and Helgeland have been preserved as a result of the Early Iron Age Scandinavian custom of depositing objects in peat bogs (*cf.* Mannering *et al.*, Franzén *et al.* this volume).

Very recently, a complete tunic in diamond twill dated to *c.* AD 300 was discovered at the melting edges of a glacier at Breiheimen. It was found in what appears to have been a base camp for hunters, tracking reindeers on the glacier. The tunic is presently undergoing conservation and study. It is likely that in the future, melting glaciers of Norway may reveal new important textile finds.

Not included in this overview are textile implements, although these are very important for understanding the full context of textiles and textile production.

Chronological and Cultural Background

The Scandinavian Bronze Age covers the period from *c.* 1800 to 500 BC. The transition between the Early and Late Bronze Age occurred *c.* 1100 BC (Kock Johansen 2000, 14–16). The Iron Age in Norway covers the period from the introduction of iron around 500 BC to

the coming of Christianity in AD 1030. This chapter deals with the Early Iron Age, from *c.* 500 BC to approximately AD 570. The Early Iron Age is divided into three periods (Solberg 2003, 38, 72, 128, 183, 218): the Pre-Roman Iron Age (500–1 BC), the Roman Iron Age (AD 1–400), and the Migration period (AD 400–570).

Sources of information about the Bronze Age and Early Iron Age in Norway are primarily archaeological, until the appearance of a few runic inscriptions around AD 200. Graves and settlements have yielded the bulk of the source material, but deposits, hill forts and iron-making installations are also important contexts for our understanding of life in Norway during the Bronze and Iron Ages (Solberg 2003, 37, 73–78, 129–136).

The earliest textile fragments in Norway date to the Early Bronze Age, when the sheep was introduced to the area as a domestic animal (Bender Jørgensen 1986, 232; Hårdh 1993, 79; Kock Johansen 2000, 60). Bronze Age society seems to have been more organised and stratified than in the semi-agricultural Neolithic period. Settlements became more permanent and subsisted on agriculture and animal husbandry, although hunting and fishing remained important (Kock Joansen 2000, 130–142). The elite probably controlled the best agricultural areas as well as the bronze trade. Chieftains in these areas had close contact with southern Scandinavia, acquiring bronze in exchange for goods such as antlers and furs (Kock Johansen 2000, 78–83; Harding 2001, 325–329). Several monumental burial mounds, containing stone sarcophagi from the Early Bronze Age have been discovered. In most of Norway, these Bronze Age mounds are in the form of cairns, and these heaps of stones with no outer protection left few preserved artefacts. South-western Norway had very close connections to Jutland in Denmark, where the mounds were built with soil on top, which provided a better environment for the preservation of textiles (Kock Johansen 2000, 86–105). The very few Norwegian Bronze Age textiles come from Rogaland in the south-west of Norway, and date to the Early Bronze Age. The transition between the Early and the Late Bronze Age included the change from inhumation burials to cremations (Harding 2001, 318–321). The Late Bronze Age tradition of cremation was

not conducive to the preservation of textiles (Kock Johansen 2000, 122–130).

With the transition to the Pre-Roman Iron Age (500–1 BC), bronze exchange networks collapsed and iron gradually became available and eventually replaced bronze (Kock Johansen 2000, 241–252; Solberg 2003, 33–65). The power base of the elite disintegrated, and society seems to have become less stratified. The Pre-Roman Iron Age was a period of growth, as settlements expanded and agricultural production intensified. Crops now probably included flax in the western part of Norway (Ringstad 1993). Although there are only a few finds of imported goods which can provide information about the long-distance contacts, religious customs, such as depositions and burials, demonstrate that Norway was part of a larger cultural tradition that included southern Scandinavia and northern Germany (*cf.* Mannering *et al.*, Möller Wiering in this volume). In the Pre-Roman Iron Age, the dead were mainly cremated and buried with only a few grave goods (Solberg 2003, 40–42). The burial customs thus account for the fact that Norway has no known textiles preserved from this period.

Norway was primarily a rural and agrarian area throughout the Early Iron Age. Most settlements were farmsteads of varying sizes. Its population increased throughout the Early Iron Age, reaching a maximum in the Migration period, when even areas with poor soil and difficult terrain were settled and adapted for agriculture (Myhre 1983). This population growth was an important factor in the development of a more stratified and well-organised society. Subsistence was based on cereal crops and livestock, but fishing and hunting continued to be important as well, particularly in areas less suitable for agriculture. Crafts were based on household production, although a development towards more specialised production appears to have occurred during the Roman Iron Age and the Migration period. Pottery, fine metalwork and advanced textile production seem to have been the work of specialised craftspeople (Solberg 2003, 158–159; Thingnæs 2007, 102–104). Furthermore, activities such as hunting, fishing and iron smelting were probably connected to seasonal production sites in coastal and mountainous areas. The Early Iron Age saw a continuous rise in the utilisation of these non-agrarian areas. The use of mountainous

areas for seasonal settlements connected to animal husbandry increased as well. The forests and mountainsides were seasonally used for grazing, hunting and iron production. The exchange goods from Norway, such as fur, hide, antler, bones, and iron, came from these non-agrarian production sites, although the trade was probably controlled and organised by the elites.

During the Roman Iron Age (AD 1–570), Roman influence reached areas far outside its empire, including Norway (Solberg 2003, 66–123). Contacts with areas south of Norway increased both the quantity of imported goods, as well as the need to provide export goods for exchange. Consequently, contact with Roman culture had a major impact on both cultural and material traditions in Norway during the Roman Iron Age (Cunliffe 2001, 440–446). Drinking equipment, weapons, glass and fine textiles were imported. The Roman weight system was adopted, and the runic alphabet developed by AD 200. The high degree of contact and exchange with northern Europe continued during the following Migration period (Todd 2001, 472–477).

On the coast of south-western Norway, centres of power were established on Jæren and Karmøy in the Early Bronze Age, and these were still important during the Early Iron Age (Solberg 2003, 118–121). Several new centres of power and wealth developed during the Roman Iron Age. Political power and status were based on the control of the best agricultural areas, military power, and exchange goods. The new chiefdoms were strategically situated so as to control the communication lines, such as major rivers and the coastline. During the Roman period, a stronger aristocracy appears to have developed through the adaptation of some Roman customs, *e.g.*, military organisation (Solberg 2003, 92–93). Some circular settlements have been interpreted as barracks for the chieftain's men. Greater riches, wider social differences and increased population pressure may have resulted in a higher degree of conflict in society. This might be one explanation for the building of several hill forts during the Roman Iron Age and the Migration period. They have been interpreted as an expression of the organised defence of several small tribal chiefdoms.

Burials from the Roman Iron Age comprise

both inhumations and cremations, and a variety of burial sites and grave markers occur (Solberg 2003, 76–78). Cremation, accompanied by a few grave gifts, was the most prevalent rite. The number of inhumations increased during the Roman Iron Age, particularly in eastern Norway. These inhumation graves included dressed bodies, with gifts of food and drink, weapons or textile equipment such as spindles, weaving swords, shears, needles and needle-cases. The inhumation tradition continued and became more prevalent during the Migration period.

The Early Iron Age was a period of great expansion. At the end of the Migration period (Solberg 2003, 124–177), even the most marginal agrarian areas were settled, crafts became more specialised, and trade with Continental Europe flourished. The Early Iron Age ended abruptly *c.* AD 570. Many farmsteads were abandoned, the number of rich graves decreased drastically, the population declined and significant social changes appear to have occurred. Burial finds are vastly diminished, and the question of whether this is due to a change in burial customs or if it reflects a true crisis and radical transformation of society has been debated. The plague is seen as the most probable cause of the population decline which ends the Early Iron Age in Norway so abruptly (Solberg 2003, 177).

Research History

The first scholar to write about prehistoric textiles in Norway was Johan Hiorth in 1907. Hans Dedekam was, however, the first to address the material in more depth by analysing the finds from Snartemo II and Evebø/Eide and using them to discuss the costume and textile production of the Migration period (Dedekam 1926). Dedekam also published the bog find from Tegle (1924). When new spectacular burials were discovered at Snartemo, Bjørn Hougen analysed the textiles along with the other grave goods and collected all known Migration period textile finds (Hougen 1935). In 1933, Hougen also published the bog find from Helgeland.

During the late 1940s, Charlotte Blindheim published several finds from the Early Iron Age, in particular a Late Roman Iron Age find from Rønseberg (Blindheim 1946). She discussed different weaving methods, including the use of

weaving swords, as well as Iron Age costume based on the position of jewellery, fibulae, belts and clasps in graves, in particular Migration period clasps (Blindheim 1947a; 1947b). Marta Hoffmann made an important contribution to research on Iron Age loom technology in 1964, with her thesis *The warp-weighted loom – studies in the history and technology of an ancient implement*, which was partly based on her analysis of the Tegle find (Hoffmann and Trættemberg 1959). It still remains the seminal work on the subject.

During the late 1970s and 1980s, there was a renewed interest in prehistoric textiles, making them more visible as archaeological source material. Bente Magnus published the textiles from the Krosshaug find (1975), as well as the textiles from the Halsnøy boat (1980). Bente Magnus and Inger Raknes Pedersen investigated the finds from Evebø/Eide (Magnus 1982a; 1982b; Raknes Pedersen 1982a; 1982b) and Blindheim (Magnus 1988; Raknes Pedersen 1988). Lise Bender Jørgensen's work (1986; 1992) on a very large amount of the textiles from prehistoric Scandinavia and Northern Europe includes catalogues of most Norwegian prehistoric textiles found in burials. Three types of textiles identified by Bender Jørgensen of relevance to the present survey are the Virring, Huldremose and Harldskjær types. The Virring group (Bender Jørgensen 1986, 140–145) comprises standardised z/s-twisted diamond twills with a high thread count identified throughout the northern fringes of the Roman Empire from the Early Roman Iron Age onwards. The Huldremose type (Bender Jørgensen 1986, 133, 345) includes s/s-twisted twills with thread counts ranging from 12/11 to 20/20 threads/cm. The Haraldskjær type refers to plain z/z-twisted 2/2 twills common throughout Scandinavia (Bender Jørgensen 1986, 64–69, 161–164). Bender Jørgensen's work created a platform for discussing issues such as loom technology and textile trade routes (Wild and Bender Jørgensen 1988). Penelope Walton's investigation of fibres and dyes in Norwegian textiles (1988) provides important information for the discussion of the import and trade in textiles.

During the 1990s, several important works on tablet-weaving appeared. Egon Hansen (1990) published a handbook, which used archaeological material as examples, including Norwegian Early Iron Age tablet weaves from Snartemo and Evebø/Eide. Another important

study is the work of Lise Ræder Knudsen (1996). She analysed and reconstructed various techniques of tablet weaving in 20 different tablet-woven bands, five of which were from the Norwegian Early Iron Age: Blindheim, the narrow two-threaded band from Snartemo II, the pattern-woven animal frieze and the horsehair patterned band from Evebø/Eide, and the pattern-woven, so-called baldric from Snartemo V.

Migration period finds from Norway have been published by Margareta Nockert (1991), who discussed the finds from Døsen, Veiem, Evebø/Eide, Ugulen, Snartemo and Øvre Berge, and included a catalogue of 34 graves with textiles found in connection with clasps.

Siv Kristoffersen (2000) touched upon the relationship between Migration period jewellery and fashion, and the social significance of textile implements in graves, in her PhD thesis on ornaments and social contexts. This subject was further investigated in her *Kvinnedrakten fra folkevandringstid – draktutstyr* (2006), which presents the brooches, pins, clasps and other jewellery found in graves in Rogaland.

Synnøve Thingnæs (2007) and the present author (Halvorsen 2008) investigated the Migration period textiles from Norway in their Master's theses. Thingnæs re-analysed and catalogued the textiles from Snartemo, Øvre Berge and Vemestad in southern Norway and focused on the question of a specialised textile handicraft during the period. The present author's work concerned textiles found in the Tegle and Helgeland bogs.

Most of the archaeological textile finds are from the 1800s and early 1900s, when it was far more common to excavate graves. Today, Norwegian archaeology focuses primarily on rescue excavations. Only a few graves have been excavated after 1980, compared to the large number of graves opened in the early years of Norwegian archaeology. Therefore, only few finds of prehistoric textiles have been added after Lise Bender Jørgensen published her catalogue in 1986. Four Early Iron Age textile finds in the Bergen Museum – three from Hordaland and one from Sogn og Fjordane, – derive from Migration period graves, but have not been analysed as yet. The Museum of Cultural History in Oslo possesses five grave finds with textiles dated to either the Early Iron Age or the Migration period. One is from Akershus, one from Vestfold and

one from Vest-Agder. The remaining two are from Hedmark, which previously had not been recorded as containing any Early Iron Age textiles. Only the textiles from Finstad, Akershus have been partly analysed. No textiles have been registered at the Archaeological Museum of Stavanger after 1982, but a re-examination of the collection led to the discovery of fragments belonging to an earlier find from Vindafjord, Rogaland.

Fibres

The majority of preserved textiles in Norway are made of sheep wool. In a combined investigation of Danish and Norwegian wool types (Walton 1988), several Norwegian Roman Iron Age and Migration period textiles were analysed. Most samples proved to belong to a class of hairy medium, and the related generalized medium fleece type. It is largely the same quality as we find in the modern Spelsau or Icelandic sheep, and it seems to be of local origin (Walton 1988, 149). Walton has demonstrated that a greater range of fleeces was available in Norway than in Denmark during this period, the medium fleece type probably being native to Norway. It is slightly finer than the hairy medium/generalised medium types. The fleeces grouped as fine were probably imported from the northern parts of the Roman Empire (Walton 1988, 152). Dyed unspun horsehair has been used to decorate several Migration period tablet-woven bands.

There is reason to believe that flax and possibly nettle and hemp were used for textile production in Early Iron Age Norway. Flax seeds have been found in Early Iron Age settlement layers (Schjølberg 1994, 263; Solberg 2003, 56, 152). Although bast fibres are seldom preserved, one Migration period fragment of a linen tabby comes from Meberg, on Lista in western Norway (Bender Jørgensen 1986, 250). Bundles of nettle stems were found with the boat from Kvalsund (Jessen 1929).

Dyes

Some Norwegian textiles have been tested for dyes (Walton 1988; Vanden Berghe *et al.* 2009). Indigotin is the most common dye ingredient in Norwegian samples and is probably derived from woad. Traces of yellow have also been found, both alone and combined with indigotin or red dye. Indigotin has been detected in

the Roman Iron Age textiles from Sætrang (Ringerike) and Hallem (Nord-Trøndelag). At Sætrang, woad was mixed with an unidentified yellow. At Hallem, there was evidence of both yellow and red dyestuffs, but their source could not be identified. Indigotin was detected alone in Øvre Berge, Snartemo V, Evebø/Eide and Helgeland. In Veiem, as in Sætrang, it was combined with an unknown yellow dye. The blue had also been mixed with another colour in a tablet weave in Snartemo V. A fine twill and a fringe in the Tegle find contained indigotin and alizarin, a red probably derived from madder. Madder was also found in the rich graves of Veiem, Snartemo V, and Evebø/Eide. In Evebø/Eide it was used in combination with an unidentified yellow dye. Insect dye, probably Polish cochineal, was detected in Veien and Evebø/Eide. Both red dyes would have been imported.

Bronze Age

Only two Norwegian Bronze Age graves yielded textiles, both rich burial mounds at Jæren and Karmøy in Rogaland, in south-western Norway (Hougen 1935, 59; Bender Jørgensen 1986, 243). These textiles are very similar to the contemporary Danish finds (*cf.* Mannering *et al.* this volume). They are tabbies with a low thread count, 4–6 threads/cm, and z/s twist (Bender Jørgensen 1986, 15–25). The material is too limited to draw general conclusions about textile production in Norway during the Bronze Age.

Roman Iron Age

The preserved Roman Iron Age textiles come from east-central and western through north-western and middle parts of Norway. The east-central finds belong primarily to graves in Vestfold and Buskerud, while most of the western finds come from Kvassheim in Rogaland. Trøndelag, Møre and Romsdal yielded some of the most spectacular textile finds from this period in Norway.

A grave mound at Sætrang, dated to AD 310/320–375, contained the burials of a man and a woman. Finds from this burial included assorted imported goods, such as gold rings, glass and weaponry, as well as textiles (Hougen 1935, 65–66; Blindheim 1947b, 9–10; Bender Jørgensen 1986, 243; Walton 1988, 150; Ræder

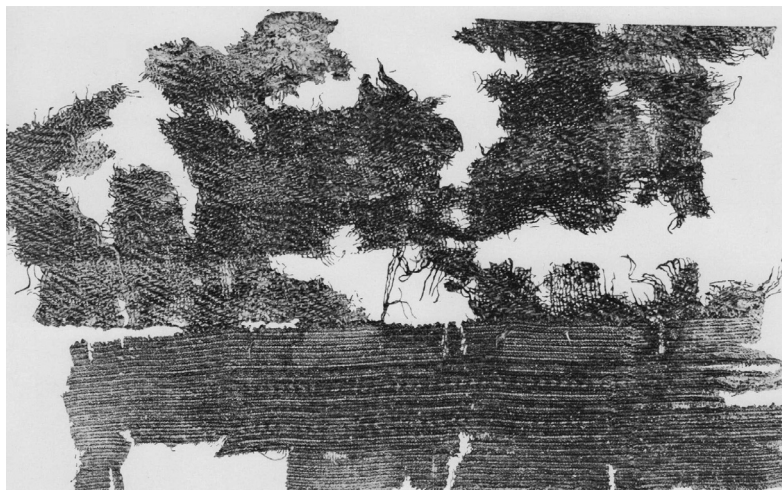
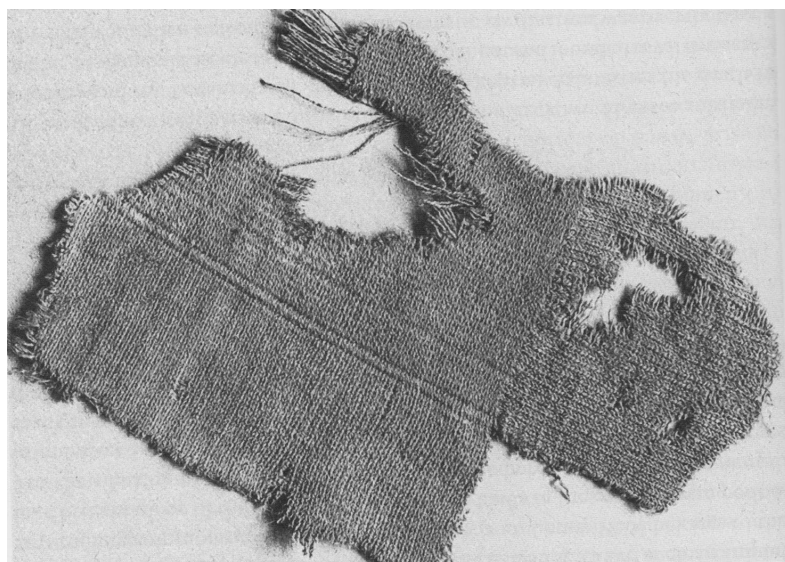


Fig. 13.1. (top) Checked twill with a tablet-woven border from Blindheim, Møre og Romsdal, c. AD 250 (After Hougen 1935, Pl. XII).

Fig. 13.2. (bottom) Corner of a mantle from Gjeite, Nord-Trøndelag, c. AD 200 (After Bender Jørgensen 2003b, 101).



Knudsen 1996, 21). Among them is the only patterned, tablet-woven band from the Roman Iron Age found in Norway, attached to a fabric of the Virring type (Bender Jørgensen 1992, 126–128, 133–136). There were also two fabrics of z/z-twisted 2/2 twill, one red and one checked in blue, red and yellowish colours.

Another important find comes from Blindheim, on Vigra, Møre and Romsdal, a mound that covers five graves dated to the Late Roman Iron Age. Three of the graves, of a man, a woman and a child, contained textiles (Hougen 1935, 64; Bender Jørgensen 1986, 245; Raknes Pedersen 1988; Magnus 1988; Ræder Knudsen 1996, 63–65). The child's grave contained the only piece of tabby from the Roman Iron Age in Norway. It is a rep,

made in S2z/z-twisted yarn. Three fabrics were identified from the female grave, all high quality textiles with checked patterns made by using colour and spin variations, as well as diamond twill binding. Two textiles seem to have had a napped surface. A broad, striped, tablet-woven band is attached to the fabric with light and dark checks (Fig. 13.1). Raknes Pedersen (1988, 119) concluded that the band had been sewn onto the textile, not woven into it, as Bjørn Hougen proposed in 1935. The fine quality of the textiles lead Magnus (1988) to suggest that they might have been imported from the provinces of the Roman Empire.

A very rich grave at Gjeite, in Levanger, Nord-Trøndelag is dated to the beginning of the Late Roman Iron Age and contained several different textile fragments of high quality, including one of the Virring type (Hougen 1935, 62–63; Blindheim 1947b, 8; Bender Jørgensen 1986, 246). It may have contained a mantle of the same kind as found in the bogs in northern Germany (*cf.* Möller-Wierring in this volume), but only one corner of it has been preserved (Fig. 13.2). It consists of two, broad, tablet-woven bands, ending in tassels where they meet. The technique is simple warp-twisting, and the bands are striped in red, yellow and blue. At least 120 paired tablets have been used to weave the bands, counting 20 tablets/cm.

A Late Roman Iron Age warrior grave at Rønseberg, Selbu, Sør-Trøndelag (Blindheim 1946; 1947b, 11) contained a reddish-brown twill with a thread count of 15/13 threads/cm. It is a 2/2 twill variation, where the weft binds in tabby at equal intervals, creating a striped look. The other fabric found in the grave is a Virring type diamond twill, in two colours, now red and black. The red thread is z-twisted, the black is s-twisted. The textile has 12 threads/cm. Blindheim (1946, 180–181), who discovered crossing threads in this fabric, along with some irregularly long floating threads, suggested that the crossing threads were wefts and indicators of several weavers working together (Blindheim 1946; Bender Jørgensen 1986, 246; *cf.* Mannering *et al.* in this volume).

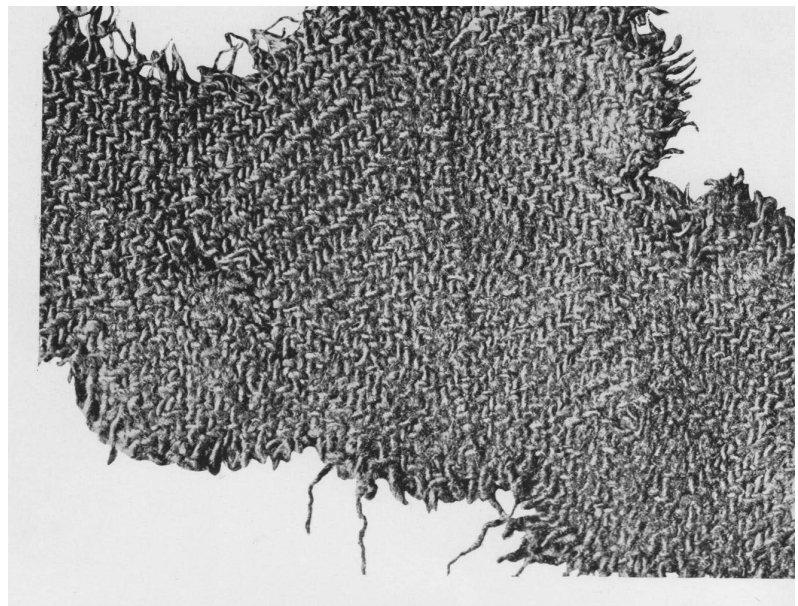
At Hallem, at Stiklestad, Nord-Trøndelag, a rich burial from the later part of the Late Roman Iron Age was excavated. It contained several textiles of high quality with colour variation. There is one Virring type textile, a red diamond twill, and a checked 2/2 twill with light ground weave and red checks. Another

fabric is striped in red, yellow and different shades of brown (Bender Jørgensen 1986, 246). Dye analyses of the Hallem textiles indicated indigotin and unidentified yellow and red (Walton 1988, 148, 150).

Another Late Roman burial find comes from Håland, Hå. It demonstrates another way of decorating textiles: here, a narrow band woven in broken/diamond twill is decorated with triangular bronze sheets (Bender Jørgensen 1986, 244).

The cemetery of Kvasheim, on Jæren, Rogaland, consisted of more than 250 graves, dated from AD 300 and well into the Migration period. Significantly more female than male graves have been identified, and the jewellery in these graves indicates connections to northern Jutland. Kvasheim has been interpreted as a centre of exchange with the southern regions, and the textiles found here share many traits with contemporary Danish material (*cf.* Mannering *et al.* in this volume). Twenty-nine graves contained textiles, of which eight graves date to the Roman period, nine are from the transition period between the Late Roman and Migration period, and twelve date to the Migration period. In the Roman period, there is a considerable amount of spin-patterned fabrics at Kvasheim, six of which are dogtooth-patterned. These textiles could be imports from the Roman areas. There are seven z/z-twisted 2/2 twills and four diamond twills. The transitional period from the Late Roman to the Migration period is characterised by a mixture of z/s and z/s-twisted 2/2 twills, and diamond twills, some of which are of high quality. With the exception of one spin-patterned textile, the Migration period textiles are all z/z-twisted 2/2 twills. Horsehair-patterned tablet weave occurs in one grave (Blindheim 1947b, 41–42; Bender Jørgensen 1986; 54–58, 160, 244–252; Lillehammer 1996).

A few textiles were found in a Late Roman Iron Age boat discovered in a bog at Halsnøy, in the southern parts of Hordaland. Rags of textiles had been soaked in tar and reused as caulking to waterproof the lapstrakes. There are two different fabrics, both of rather fine quality. One is a 2/2 diamond twill, with a thread count of 13/18 threads/cm. The other is a spin-patterned 2/2 twill, with 15/16 thread/cm (Magnus 1980; Bender Jørgensen 1986, 160).



Migration Period

Most of the Migration period textile finds come from southern and western Norway. Only a few Migration period graves with textiles have been found in south-eastern Norway: one in Østfold, one in Buskerud, nine in Vestfold and two in Telemark (Bender Jørgensen 1986, 64, 247–249).

The largest cemetery in eastern Norway is located in Veien, Ringerike, Buskerud. It is situated in an agriculturally rich inland region, which appears to have been a centre of power from the Early Roman Iron Age onwards. Its wealth and influence were probably due to the control of the trade routes and the production of trade commodities in the mountainous inland regions (Solberg 2003, 106). The Veien grave was rich both in textiles and other grave goods. The grave contained a narrow, tablet-woven band with individually turned tablets, which was attached to a red, z/z-twisted diamond twill, with a fulled surface. There were also a red z/z-twisted 2/2 twill and a red z/s-twisted diamond twill, as well as several different fragments of coarser 2/2 and diamond twills (Fig. 13.3). One special fabric was probably a mixture of wool and plant fibre; the presence of the latter was deduced from the fact that every fourth thread is missing (Hougen 1935, 67; Bender Jørgensen 1986, 247; Walton 1988, 148). Red dyestuff made of imported Polish cochineal was detected in one of the Veien textiles (Walton 1988, 148).

Fig. 13.3. Diamond twill from Veien, Buskerud (After Hougen 1935, Pl. XII).

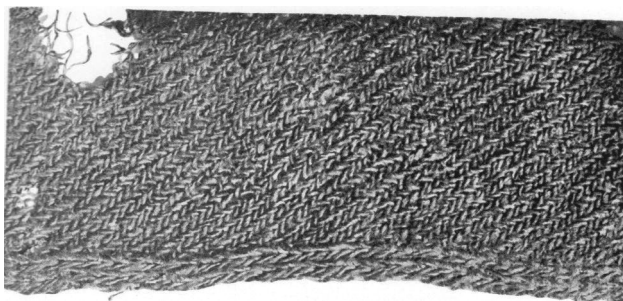


Fig. 13.4. Twill with tablet-woven border from Snartemo V, Vest-Agder, c. AD 500 (After Hougen 1935, Pl. XIII).

A grave at Vestrum, Hedrum, Vestfold, contained a band 5.2 cm wide, woven in z/s-twisted broken 2/2 twill, with a thread count of 36/17 threads/cm, and considered to be imported from outside Scandinavia (Hougen 1935, 67; Bender Jørgensen 1986, 164, 248). In addition, there was a red fabric in broken 2/2 twill, z/z-twisted with 16/16 threads/cm.

In Agder, in southern Norway, 21 Migration period graves contained textiles (Bender Jørgensen 1986, 64, 248–251). Several of these are of a high quality, with thread counts of 18–20 threads/cm. The coastal areas of Vest-Agder seem to have been a wealthy area during the Migration period. It was a transit area for exchange southwards and towards the coast, with vast inland resources. In her discussion of the Migration period warrior costume, Lise Bender Jørgensen (2003a, 77) mentions nine graves that contained textiles with similar traits. Five of these graves are from Agder: Snartemo II, Snartemo V, Øvre Berge, Vemestad and the now lost Trygslund find. These graves have exceptionally rich grave goods, including weaponry, textiles and other objects. Common for all these graves is the presence of a blue/green and/or a red tunic, trimmed with horsehair-patterned, tablet-woven bands.

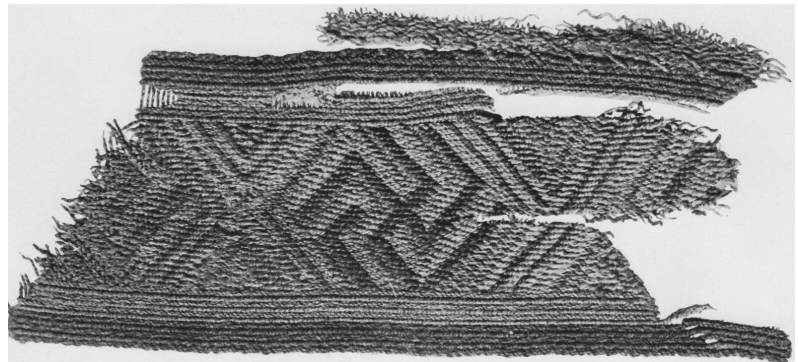
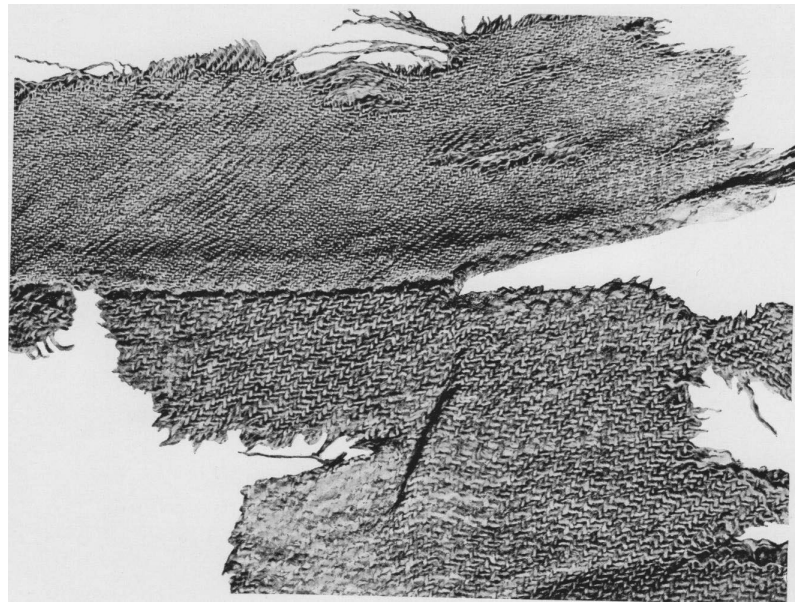
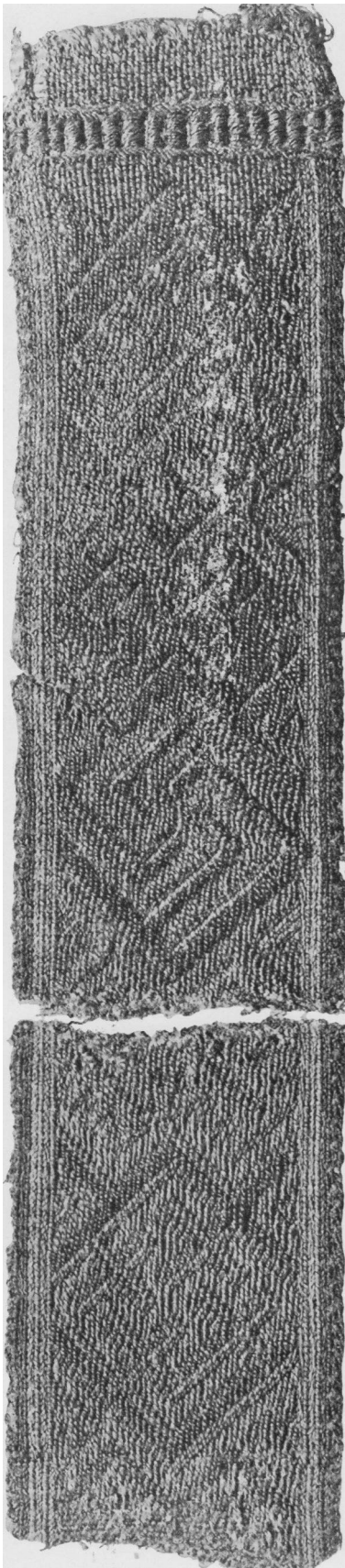
The site of Snartemo is particularly well known for its Norwegian Migration period textiles. The Snartemo burials are very rich, containing imported goods, gold objects, assorted and lavishly decorated weaponry and fine textiles (Dedekam 1926; Hougen 1935; Bender Jørgensen 2003a; Thingnæs 2007).

Snartemo grave II contained three different tablet weaves. Four pairs of clasps with reddish, tablet-woven bands have probably been attached to what might once had been a blue/green tunic. The clasps might also have belonged to two other garments, one red and one blue/green. The tablet-woven bands to which the clasps were attached were patterned

with both horsehair and wool. One narrow band is woven in two shades of red in simple warp-twining. The last band is patterned with tablets turned individually, forming a pattern of an animal figure, in red, blue and yellow. The woven fabrics are all twills and it is difficult to establish the number of types there might have been due to the poor excavation and conservation. The twills are now reddish, blue/green and yellowish, and some fabrics have once been striped or checked (Dedekam 1926; Hougen 1935; Blindheim 1947b, 11–14; Bender Jørgensen 1986, 250; Walton 1988, 148–150; Nockert 1991, 59–63; Ræder Knudsen 1996, 71; Thingnæs 2007).

The context and stratigraphy of the Snartemo grave V textiles are not clear: it may have been a single grave, but it might also have contained a secondary burial. The number of different fabrics the grave contained is not fully established, but Synnove Thingnæs (2007) has recently provided an overview of how the fragments might be grouped. All fabrics are 2/2 twills and most of them share the typical Migration period traits of z/z-twist and a thread count of 12–14 threads/cm. Two blankets lay on top of the body; one was made of a bi-coloured, spin-patterned fabric, with a thread count of 8–9 thread/cm, and the other of a blue/brown z/z-twisted fabric with a thread count of 7–9 threads/cm. Two other fabrics might be from a mantle or some kind of upper-body garment. These are S2z/z-twisted, with thread counts of 11–13 threads/cm. One of them is striped in two colours, the other is red. Thingnæs (2007) believes the madder-red fabric with a horsehair-patterned, tablet-woven band in red and blue to be a mantle (Fig. 13.4). A fabric interpreted as part of the trousers is now of a light brown colour, while the tunic seems to have been woad-dyed blue/green. Additionally, there is at least one fabric of unknown use; it is of green/blue, brown and reddish colours. One tablet-woven band, often interpreted as a baldric (Fig. 13.5), is geometrically-patterned in blue, yellow, red and green by individually turned tablets (Dedekam 1926; Hougen 1935; Blindheim 1947b, 11–14; Bender Jørgensen 1986, 250; Walton 1988, 148–150; Nockert 1991, 59–63; Ræder Knudsen 1996, 84; Thingnæs 2007).

A burial at Øvre Berge, Lyngdal, Vest-Agder, contained three types of 2/2 twills. A z/s-twisted fabric, woven of light and dark wool,



with a thread count of 8–10 threads/cm, has been interpreted as a blanket. Another z/z-twisted fabric, with a thread count of 13–14 threads/cm, which was probably a tunic, was dyed blue/green. Gores of a denser fabric had been inserted into this fabric (Fig. 13.6). These are made of a striped reddish, z/z-twisted fabric, with 25 threads/cm. Attached to the piece of blue twill was a tablet-woven band (Fig. 13.7), geometrically-patterned with individually turned tablets in red, yellow and blue (Hougen 1935, 77–78; Blindheim 1947b, 15–18; Bender Jørgensen 1986, 251; Walton 1988, 148–150; Nockert 1991, 63–64; Thingnæs 2007).

Three graves containing textiles were found in Øvre Vemestad, Lyngdal, Vest-Agder. The best preserved was a male grave (Inv. C8983-98), containing 3–4 types of z/z-twisted twills. One is a red diamond twill, the others are 2/2 twills. One is chequered in shades of red, while another fabric was originally green. No

Fig. 13.5. (left)
Tablet-woven band from
Snartemo V, Vest-
Agder, c. AD 500
(After Hougen 1935, Pl.
XIV).

Fig. 13.6. (top right)
Two twill fabrics sewn
together, Øvre Berge,
Vest-Agder (After
Hougen 1935, Pl.
XVIII).

Fig. 13.7. (bottom right)
Tablet-woven band from
Øvre Berge, Vest-Agder
(After Hougen 1935, Pl.
XVIII).



Fig. 13.8. The warp from the Tegle find (©Arkeologisk Museum i Stavanger).

tablet weaves were found in this grave, but an adjacent grave, B4414, contained a reddish, horsehair-patterned band attached to blue or green twill (Hougen 1935, 76–78; Bender Jørgensen 1986, 251; Thingnæs 2007, 76).

In the Rogaland region in south-western Norway, 24 Migration period graves with textiles have been found, 12 of which are from the cemetery in Kvassheim, where Roman period textiles have also been found (Bender Jørgensen 1986, 252–253).

One unusual find from Rogaland comes from Midt-Salte, where raw wool and s-twisted yarn were included along with the grave goods (Bender Jørgensen 1986, 252; Walton 1988, 148–150). Rogaland has also yielded two important bog finds. Bog textiles are far less common in Norway than in Denmark and northern Germany (*cf.* Mannering *et al.*, Möller-Wiering, Möller-Wiering and Subbert in this volume); however, textiles have been discovered in three Norwegian bogs, although none of them are connected to bog bodies.

The find from Tegle, Jæren, Rogaland has

been of great importance for the discussion of loom technology in the Early Iron Age (Dedekam 1924; von Walterstorff 1928; Hougen 1933; Hougen 1935, 82; Hoffmann and Trættemberg 1959; Hoffmann 1964; Halvorsen 2008; 2009; 2010). The find contained an entire warp for a warp-weighted loom (Fig. 13.8). The warp was made by tablet weaving, where the tablet weft had been pulled out in loops to form the warp for the ground weave. The wool warp was found in a bag sewn of a coarsely woven fabric. The bag also contained several different types of wool yarn, unspun wool, twisted hair, a sprang tube, a tablet-woven fringe and several textile fragments (Fig. 13.9). The sprang tube was started and finished with tablet weave. It provides the earliest evidence of sprang in Norway. A fragment of fine 2/2 twill had a tablet-woven border. It had been dyed with indigotin and alizarin, possibly deriving from woad and madder (Vanden Berge *et al.* 2009). A tablet-woven fringe, made by pulling out the weft in small loops on one side, was also of a fine quality. It had been dyed with woad and



madder in the warp, and madder in the weft (Vanden Berge *et al.* 2009).

In contrast to the Tegle find, at Helgeland, Sandeid, Rogaland, textiles were dispersed in the bog over an area of at least 20 m² (Hougen 1933; 1935, 83; Halvorsen 2008; 2009; 2010). At least seven different fabric types have been found, all z/z-twisted 2/2 twills, with 8–16 threads/cm. At least one of these fabrics was dyed with woad (Vanden Berge *et al.* 2009; Halvorsen 2009). Some of the textiles have seams, and were probably fragments of

clothing, although little can be deduced about their shape and size. The find also includes probably the best preserved tablet-woven band from Early Iron Age Scandinavia (Fig. 13.10). It is a broad band made of wool, 10.5 cm wide, with approximately 80 tablets and woven with a complex geometrical pattern. The ground weave now looks reddish and the pattern is light brown. Traces of yellow dye have been found in the band (Vanden Berge *et al.* 2009; Halvorsen 2009). Many fragments of the band are preserved, indicating that the band

Fig. 13.9. (top) The Tegle find contents: top left – fringe; bottom left – twill fragment; right – sprang tube (©Arkeologisk Museum i Stavanger).

Fig. 13.10. (bottom) A fragment (Af) from the broad tablet weave from the Helgeland find (©Arkeologisk Museum i Stavanger).

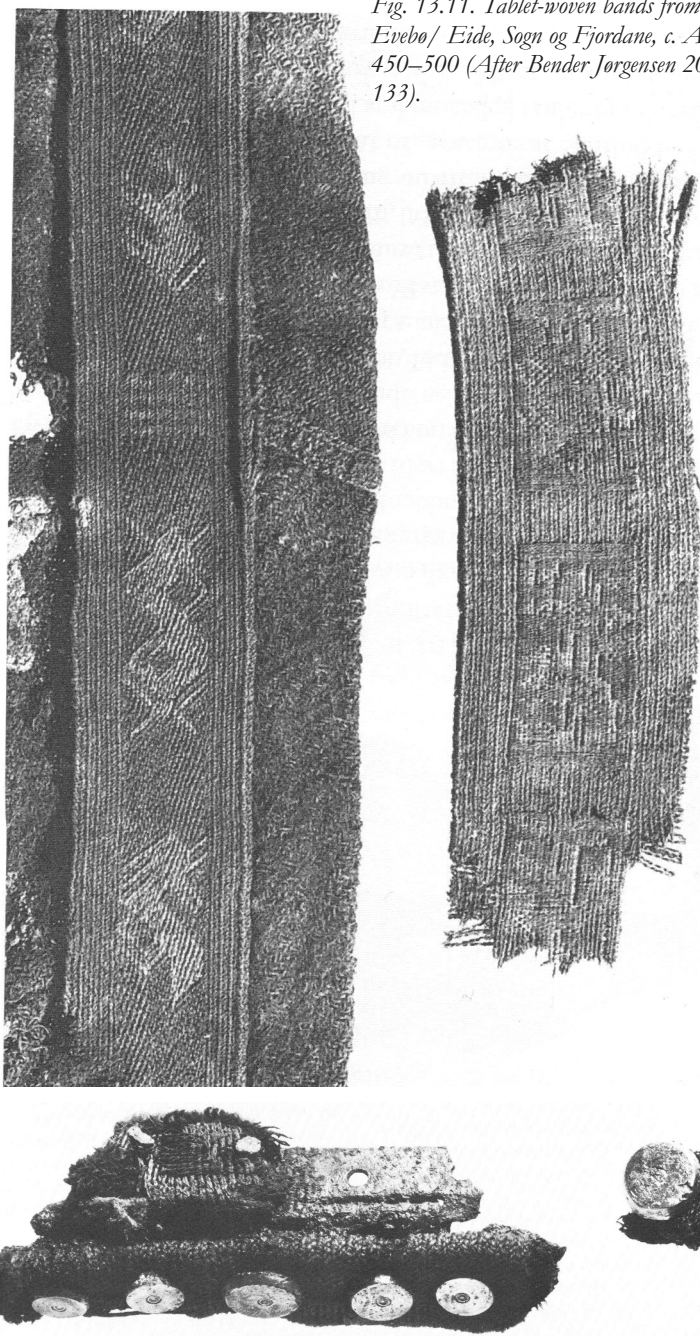


Fig. 13.11. Tablet-woven bands from Evebø/ Eide, Sogn og Fjordane, c. AD 450–500 (After Bender Jørgensen 2003a, 133).

Fig. 13.12. Wrist clasps with a tablet-woven band from Veiem, Nord-Trøndelag (After Bender Jørgensen 1986, 66).

was at least 250 cm long (Halvorsen 2010). In addition to textiles, a bundle of human hair as well as some unspun wool and two glass beads were found in the bog.

Fifteen Migration period graves in Hordaland yielded preserved textiles (Bender Jørgensen 1986, 253–254). Some of the best known Migration period textiles come from three graves in Døsen, Os, Hordaland. They are well preserved and the stratigraphy of the textile layers is known. In the best preserved

male grave B6091, three textiles were identified as blankets which had been wrapped around the body. They were coarse and full. Two sleeves, 40 and 46 cm long, were preserved up to the gores under the arms. One preserved sleeve has three gores, while the other has just one. The opening is 7 cm wide and is finished with a cuff made of folded textile (Nockert 1991, 46). These sleeves are important for the discussion of Migration period costume. The grave also contained tablet-woven bands with geometrical patterns.

In the female grave B6090, there is a fragment of rep and several z/z-twisted 2/2 twills. Additionally, there are wrist clasps attached to tablet weaves patterned with individual turns. The Døsen finds demonstrate that both women and men wore garments with long, fitted sleeves. However, Margareta Nockert (1991, 110) has shown that there are more clasps in male graves, which might indicate a gender differentiated costume tradition (Hougen 1935, 79–80; Blindheim 1947b, 19; Bender Jørgensen 1986, 254; Walton 1988, 148–150; Nockert 1991, 46–47).

Sogn og Fjordane has 10 Migration period graves with preserved textiles, while Møre and Romsdal has only four (Bender Jørgensen 1986, 255). Two of the graves from Sogn og Fjordane belong to the nine very rich, warrior graves mentioned earlier (Bender Jørgensen 2003a, 67–68).

Ugulen, Luster, Sogn og Fjordane (Blindheim 1947b, 84; Bender Jørgensen 1986, 255; Nockert 1991, 58–59) yielded two graves with horsehair-patterned, tablet-woven bands. A warrior grave B6092 contained four broad clasps. The best preserved band is presently 7.2 cm wide and made with 80 tablets. The band is patterned with yellow and green wool, and has been attached to a green garment made in z/z-twisted 2/2 twill, with 12x12 thread/cm.

A rich chieftain's grave at Evebø/Eide, Gloppen, Sogn og Fjordane, is one of the best known Migration period finds (Dedekam 1926; Hougen 1935, 80–82; Blindheim 1947b, 19–21; Magnus 1982a; 1982b; Raknes Pedersen 1982a; 1982b; Bender Jørgensen 1986, 255, 162–163; Walton 1988, 148–150; Nockert 1991, 50–58; Ræder Knudsen 1996, 82, 100; Thingnæs 2007, 80–83). In addition to fine import goods, the find contained several dyed textiles, as well as some tablet weaves. The textiles were well preserved, and as the grave was excavated professionally,

the spatial context and stratigraphy of the textiles are well documented. The man was probably dressed in two tunics, trousers and a cloak, of which a corner is preserved. The textiles are all 2/2 twills, with thread counts ranging from 14–16 to 18–20 threads/cm, and some are fulled. Several of the textiles are checked and both fabrics and bands are dyed with red, blue, green and yellow. The cloak is red with yellow and green checks and has a fulled surface. It is decorated with a 2.7 cm wide tablet-woven border and has fringes. This band has a zoomorphic pattern, made by turning the tablets individually (Fig. 13.11). Of the two tunics, the innermost had 20–24 threads/cm, and was fulled and dyed with Polish cochineal. This tunic also had wrist clasps and might have been trimmed with two different tablet-woven, horsehair-patterned bands, located on the cuffs and on the lower edge of the garment. The outer tunic was dyed with woad and decorated with tablet-woven bands with a zoomorphic frieze. A red fabric with blue/green checks has been interpreted as the trousers.

There are five Migration period graves with textiles found in Trøndelag. From the areas further north (in Nordland), only three graves were found with Migration period textiles (Bender Jørgensen 1986, 256–257).

Veiem, Grong, Nord-Trøndelag discovered in 1976, is regarded as one of the most elaborate warrior graves from the Migration period (Farbregd 1979; Bender Jørgensen 1986, 256; Nockert 1991, 47–50). The costume recovered had four clasps, two smaller and two larger, although their original position is unknown (Fig. 13.12). The clasps had been attached onto horsehair-patterned, tablet-woven bands, the best preserved of which is 7.7 cm wide, and is made with 84–87 tablets (Nockert 1991, 49). The bands, dyed yellow, blue and madder-red, were attached to a z/z 2/2 twill, fabric with 14/16 threads/cm. This fabric was dyed green with woad and a yellow dye, while the seams were made in red and white yarn. One tablet-woven band has been interpreted as a possible baldric. This is a pattern-woven band, striped in yellow, red and blue/green. Bronze foil was folded around the band to reinforce a seam, and it might have been lined with leather. One broad clasp is attached to a red, horsehair-patterned, tablet-woven band, and a polychrome z/z-twisted 2/2 twill fabric. A coarse 2/2 twill has

been interpreted as a blanket, and there are several 2/2 twills with thread counts of 8–13 threads/cm (Bender Jørgensen 1986, 256; Nockert 1991, 47–50).

Conclusions

Most of the textiles in the Norwegian corpus are fabrics woven on a loom, although tablet weaving and sprang techniques are also attested. A unique exception is a piece of felt from Seglheim dated to the transition between the Roman Iron Age and the Migration period. Unspun wool was found in a grave from Øvre Salte, from the Migration period, and in the bog finds from Tegle and Helgeland.

The material is too limited to draw any conclusions concerning textile production in Norway during the Bronze and Pre-Roman Iron Ages. However, a sufficient amount of archaeological textiles from the Roman and Migration periods survives to provide an overview of textile technology during this time in Norway.

Roman period textiles are distinguished by a variety of weaves and combinations of twist direction (Bender Jørgensen 1986, 51–58). Only six textiles have been registered from the Early Roman Iron Age, each from different graves. Five of these have features in common with the material from Denmark (*cf.* Mannering *et al.* this volume), belonging to the so-called Huldremose type (Bender Jørgensen 1986, 133, 345). The last of these Early Roman textiles is a z/s-twisted diamond twill with 22/19 threads/cm of the so-called Virring type (Bender Jørgensen 1986, 140, 346). It is found in Denmark from the second phase of the Early Roman period and is known in rich graves throughout the Late Roman Iron Age in Scandinavia (Bender Jørgensen 1986, 29–58, 346–348). The Virring group of textiles has been identified throughout the northern fringes of the Roman Empire from the Early Roman Iron Age onwards, and has been found in Poland, northern Germany, Holland and Britain (Bender Jørgensen 1986, 140–145; *cf.* Möller Wiering and Subbert, Maik, Wild in this volume).

The Virring type shows a remarkably uniform quality, which is interpreted as an indication of professional production. It is often found in combination with Roman imports, and it disappears at the end of the

Roman Iron Age. Lise Bender Jørgensen (1986, 141–146; Wild and Bender Jørgensen 1988) has interpreted it as a textile type imported from the northern provinces, of possibly Gallo-Roman origin. The Virring type is found in 19 Norwegian graves from the Late Roman Iron Age, all of which are rich burials; among these are the famous graves from Gjeite and Sætrang (Bender Jørgensen 1986, 51–58, 140–146).

There are 71 preserved textiles from the Late Roman Iron Age in Norway, deriving from 32 graves (Bender Jørgensen 1986, 51–58). Of these, 61.5 % are 2/2 twills and 37 % are broken/diamond twills. There is only one tabby (1.5 %). Thread counts vary between 9 and 40 threads/cm, although commonest are thread counts of 12–16 threads/cm. The broken/diamond twills come from 17 different graves, mostly classified as belonging to the Virring group. The 2/2 twills of the Late Roman Iron Age are z/z-twisted (7 graves), z/s-twisted (10 graves) or spin-patterned (12 graves). This corresponds well with textiles from the rest of Scandinavia (Bender Jørgensen 1986, 59–64). The z/z-twisted twills are especially common at Kvassheim (Bender Jørgensen 1986, 51–58).

Spin-patterned twill textiles are characteristic of the Late Roman Iron Age, although their use continues into the Migration period (Bender Jørgensen 1986, 55–58, 68, 155–161). They occur in 12 graves dated to this period, three of which are dated to the transition between the Roman and Migration periods, and five to the Migration period. The sites are mainly located in the western part of Norway. Twelve of these textiles are woven in a dogtooth pattern. Nearly all dogtooth patterns in Norway are from the final phase of the Roman Iron Age, or the Early Migration period (Bender Jørgensen 1986, 55–58, 68, 155–161).

Due to the prevailing burial custom of inhumation in a stone cist inside a mound, the Migration period has yielded a relatively large quantity of well-preserved textile finds from all over Norway (Bender Jørgensen 1986, 64–69). A total of 267 different textiles from 97 graves have been recorded, of which 211 are loom-woven fabrics and 56 are tablet weaves. The Migration period is distinguished by exceptionally fine tablet-woven bands and many plain 2/2 twills, z/z-twisted with 12–16 threads/cm. Migration period costume was distinguished by metal clasps attached at the

openings of the garments, especially at the wrists. These were attached to cuffs, which in many finds are trimmed by tablet-woven bands. The metal clasps have often preserved the tablet weaves in a mineralised state, providing us with an insight into a remarkable textile tradition of high quality tablet weaving (Bender Jørgensen 1986, 64–69, 161–164; Nockert 1991, 46–64).

Of the fabrics, 1.9 % are tabbies, 91.5 % are 2/2 twills, and 6.2 % are broken/diamond twills. Of the tabbies, one piece is plain tabby, the rest are reps. The twist direction clearly differs from the Roman Iron Age textiles: only one piece is s/s-twisted, 4.3 % are z/s-twisted and 2.4 % are spin-patterned. The Migration period textiles are generally z/z-twisted (90.5 %). Thread counts vary between 5 and 36 threads/cm, with 8–16 threads/cm being the most common. There are a few textiles which combine plied and single thread, a trait Bender Jørgensen (1986, 65) has identified as a possible special characteristic of cloaks. One of the few tabbies is made of linen. The plain z/z-twisted 2/2 twills of the Haraldskjær type are also common in the rest of Scandinavia (Bender Jørgensen 1986, 64–69, 161–164).

The Roman period and especially the Migration period are distinguished by tablet-woven bands adorning the clothing. From the Roman Iron Age onwards, tablet weaving was used either for simple starting borders using only a few tablets, or for sophisticated variations of decorative bands. The Roman Iron Age textiles provide six examples of tablet weaves, while there are 56 from the Migration period. The large number of tablet-woven bands from the Migration period is probably connected to the contemporary costume tradition of using metal clasps attached to cuffs and at the openings of the garment. The tablet-woven borders from the Roman Iron Age are all made in a simple, warp-twisting technique, except for one that is patterned with individually turned tablets. Three graves in Norway dated to the transition to the Migration period contained tablet-woven borders, one of these patterned with horsehair (Bender Jørgensen 1986, 64–65).

While the tablet weaves of the Roman Iron Age were mostly simple warp-twined bands, the tablet weaves from the Migration period are often patterned. Three different patterning techniques have been distinguished so far. Of the 56 tablet weaves from graves, 21 are patterned with horsehair and weft-wrapped

in a tapestry-like technique. Seventeen bands are patterned by the individual turning of the tablets. One band, from the bog find of Helgeland, is warp-twined and brocaded with a pattern thread in wool (Bender Jørgensen 1986, 64–65; Nockert 1991, 140–149).

Textiles, including their production techniques and usage, relate closely to human life. Our understanding of prehistoric textiles in Norway hence forms an important part of our overall knowledge of life in prehistoric Norway. Most of the textiles seem to be locally produced, but research has also demonstrated how textiles and dyes can be used to trace exchange networks and cultural contacts between Norway and the rest of Scandinavia, and further into Continental Europe. Textiles also provide an important insight into social hierarchies and craft organisation during the Early Iron Age. This survey of prehistoric textiles in Norway has attempted to show that, although preservation conditions and burial traditions have left vast gaps in our knowledge of textiles for some time periods and social groups, there are large and important collections of textiles that can help us understand different aspects of textiles in prehistoric Norway. Research into various aspects of prehistoric textiles has intensified over the years, but many questions remain unanswered. It is hoped that new methods and questions will provide a deeper insight into prehistoric textiles of Norway.

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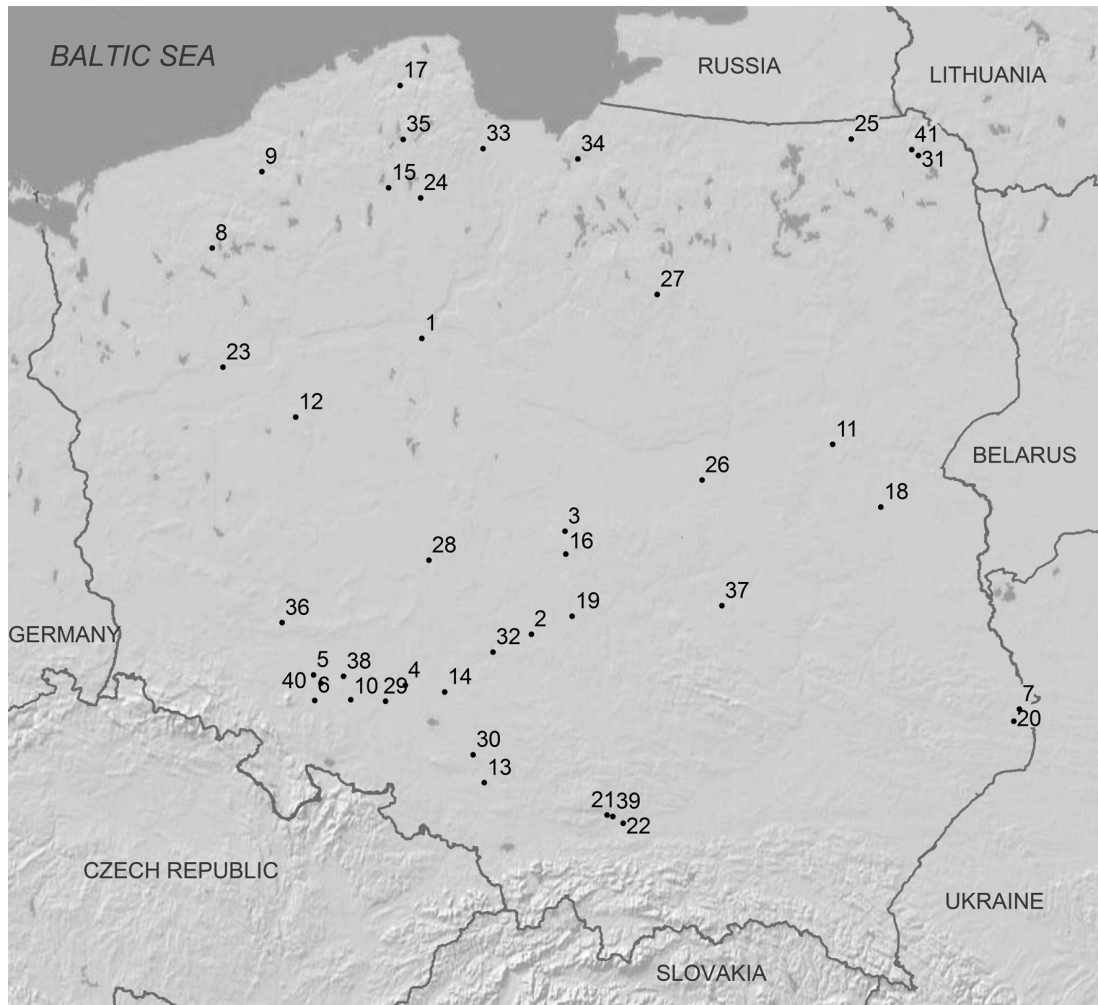
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POLAND

Neolithic period	5500–2200 BC
Early Bronze Age	2200–1500 BC
Middle Bronze Age	1500–1300 BC
Late Bronze Age	1300–800 BC
Hallstatt C	800–550 BC
Hallstatt D	550–400 BC
La Tène period	400–1 BC
Early Roman period B	AD 1–150
Late Roman period C	AD 150–375
Migration period	AD 375–600

POLAND



Map 14.1. Poland. Sites mentioned in Chapter 14:

1 Biskupin	12 Kowalewko	23 Nowy Łowicz	34 Weklice
2 Chabielice	13 Łabędy-Przyszówka	24 Odry	35 Węsiory
3 Chrzastów	14 Lasowice Małe	25 Osowa	36 Wołów
4 Domaradz	15 Leśno	26 Ożarów Mazowiecki	37 Zakrzew
5 Domasław	16 Łódź	27 Pielgrzymowo	38 Zakrzów
6 Głownin	17 Lubowidz	28 Piwonice	39 Zielonki
7 Gródek	18 Maciejowice	29 Stare Kolnie	40 Żerniki Wielkie
8 Gronowo	19 Mąkolice	30 Świbie	41 Żywa Woda
9 Grzybnica	20 Masłomęcz	31 Szwajcaria	
10 Jankowice	21 Modlnica	32 Toporów	
11 Jartypory	22 Nowa Huta-Mogiła	33 Ulkowy	

Poland

Jerzy Maik

Introduction

Due to the small number of extant archaeological textile finds, our knowledge of textiles in present-day Poland and the former Polish territories is scanty. Textiles first make their appearance in the territory of Poland in Neolithic times as attested by a few tabby imprints found on pottery fragments. However, the textile evidence remains scarce until the Hallstatt period to which the earliest textiles preserved in an organic state can be dated. The material becomes more abundant during the Roman period. During the Bronze and the Early Iron Ages, the manufacture of textiles remained at a household level, expanding only during the Roman period.

Chronological and Cultural Background

On the territory of Poland, the Bronze Age began around 2200/2100 BC, *i.e.* a few hundred years later than in the eastern part of the Mediterranean region (the first half of the 3rd millennium BC) and also later than in the middle of the Danube Basin (about 2400 BC), from where new cultural currents reached the Polish area. The Bronze Age in Poland can

be divided into five periods according to the modified Montelius system (Kaczanowski and Kozłowski 1998, 41–46).

Although the epoch is referred to as the Bronze Age, bronze as a metal was little used save for ornamentation, while stone remained the prevalent material for making tools. In the territory of Poland, Neolithic cultures had survived, particularly the Corded Ware culture and the Únětice culture, which developed in the area that today comprises the Czech Republic (*cf.* Belanová-Štolcová in this volume). Subsequently, two large archaeological cultures came into being: the Pre-Lusatian culture, deriving from the Tumulus culture, in the Oder basin; and the Trzciniec culture in the Vistula basin. The Pre-Lusatian culture is primarily known from burial grounds. The lack of large, permanent settlements seems to support the hypothesis of a nomadic or pastoral economy. The Trzciniec culture, on the other hand, was agricultural in character, based on animal and crop husbandry.

The dead of the Pre-Lusatian culture were interred in burial mounds (tumuli) with inhumation graves, whereas both inhumation and, less frequently, cremation burials were common in the Trzciniec culture.

Between 1300 and 1200 BC, a variety of

cremating cultures appear in Central and Western Europe. A segment of the Urnfield culture characteristic for Poland is referred to as the Lusatian culture. It spread in the Oder and Vistula Basins as well as in the northern Czech lands, Saxony, Lusatia and Brandenburg. The fundamental feature of this new culture was its burial rite – primarily flat cremation graves. However, a number of related regional groups developed in the vast area comprising the Lusatian culture.

From the Bronze Age onwards, and throughout the entire period discussed here, Baltic cultures flourished in north-eastern Poland, to the east of the Vistula River estuary (Jażdżewski 1965, 20, 130–131, 141, 159; Jażdżewski 1984, 204–206, 227–229, 252–262; Kaczanowski and Kozłowski 1998, 41–46, 142–164).

The onset of the Iron Age was also delayed in the territory of Poland compared to southern Europe. Around the 8th century BC, the Hallstatt culture developed in the area where the Urnfield culture once flourished. In the west, it spread as far as eastern France; in the east, it reached the middle of the Danube Basin; and in the south-east, the new culture penetrated areas bordering the Adriatic. The Hallstatt culture exerted a major influence in the Oder and Elbe Basins, as well as in the Alpine region. Iron came into widespread use there at the beginning of the 1st millennium BC, while in the Polish territories, the Iron Age began around the mid-8th century BC. Bronze artefacts remained in common use and iron objects were a rarity. Within the Iron Age, a number of subdivisions can be distinguished. In Poland, the Hallstatt period is subdivided into the Hallstatt C, lasting until around 550 BC, and Hallstatt D, which ended *c.* 400 BC (Kaczanowski and Kozłowski 1998, 41–46).

Strong contacts with the Hallstatt culture can also be observed in the Polish areas, where the Lusatian culture with its regional subcultures still dominated. The influence of the Hallstatt culture is clearly visible in southern Poland, particularly in Silesia, where numerous imports from Hallstatt cultural areas have been excavated. These are mainly bronze and iron objects. However, no evidence of iron production at the beginning of the Iron Age in the territory of Poland has been found thus far.

One of the key elements of the Lusatian

culture in the Hallstatt period consisted of large fortified settlements, including the well-known site at Biskupin, situated at the borderland between Greater Poland and the Kujawy region. Traditionally, the site was dated to phase D of the Hallstatt period, but recently, dendrochronological investigations have demonstrated that it dates back to the 730s BC.

In the Early Iron Age, cremation burials were another dominant feature of the Lusatian culture. However, a number of inhumation graves dated to the Hallstatt period have been discovered in Silesia. At the end of Hallstatt D, the Lusatian culture was replaced by the Pomeranian culture and in eastern Poland, by the Bell Grave culture (Jażdżewski 1965, 129; Jażdżewski 1984, 277–279, 309–318; 323–326; Kaczanowski and Kozłowski 1998, 41–46, 174–178).

These cultures were influenced by the La Tène culture which flourished from around 400 BC to the beginning of the 1st century AD. It was characterised by a great Celtic expansion, which took place in large parts of Europe, the territory of Poland included. Its influence is especially notable in southern Poland, *i.e.* in Silesia and Lesser Poland.

The Pomeranian and Bell Grave cultures were replaced by the Przeworsk culture, which spread over the vast majority of the territory of Poland and Oksywie in Pomerania (Jażdżewski 1965, 139–140; Jażdżewski 1984, 277–279, 331–336; Kaczanowski and Kozłowski 1998, 41–46, 196–230).

The third important period of the Iron Age in Poland is the Roman period. In the Polish territories, it lasted from the beginning of the 1st century AD to around AD 375. During this time, the Roman Empire exerted an immense influence on the peoples inhabiting central Europe, including the Polish areas. The chronology of the Roman period in the Polish territories is based on Egger's chronology with regional modifications. The period is subdivided into the Early Roman period (phase B with subphases B₁ and B₂) and the Late Roman period (phase C with subphases C₁, C₂ and C₃). A transition phase (B₂/C₁) has also been distinguished (Kaczanowski and Kozłowski 1998, 41–46).

During the Roman period, the Przeworsk culture continued. In the beginning, it occupied almost the entire Greater Poland, Silesia,

Mazovia and Lesser Poland. In Pomerania, in the area of the Oksywie culture, the Wielbark culture developed at the beginning of the Roman period. It was commonly associated with the Goths, who left their Scandinavian homes to travel to Ukraine and the Crimea. Both cultures existed throughout the entire Roman period. The Wielbark culture developed in areas along the lower Vistula, but subsequently spread over the entire region of Pomerania, eventually reaching northern Greater Poland, the Kujawy region, Mazovia and the Lublin district, which were previously occupied by the Przeworsk culture. Both cultures were characterised by the cremation burial rite. However, inhumation graves occur throughout the entire period in the cemeteries of the Wielbark culture.

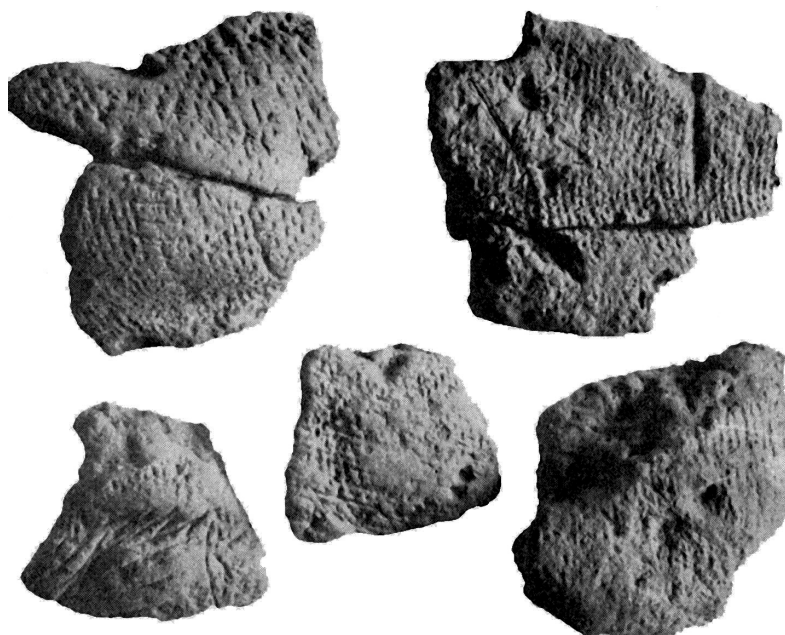
The end of the Roman period heralded the onset of the Migration period with the massive Hun invasions of Europe at the close of the 4th century AD. The Migration period continued to the beginning of the second half of the 6th century AD (the conquest of the Carpathian Basin by the Avars) or, according to other researchers, until the end of the 7th century AD, the time of the indisputable Slav domination in Central Europe and the beginning of the Early Middle Ages (Jażdżewski 1965, 147–166; Jażdżewski 1984, 277–279, 400–410; Kaczanowski and Kozłowski 1998, 41–46, 279–324).

Research History

Although some textile finds were studied before World War II by the German scholars Gertrud Sage (1934a; 1934b) and Walter von Stokar (n.d. a, b, c), most of the research has been carried out since the 1970s. The present author has analysed much of the Polish prehistoric and Roman period material (e.g. Maik 1977; 1979; 1988; 1990; 2001a; 2002; 2004; 2005b). An overview of the material from graves was published by Lise Bender Jørgensen (1992, 84–92). Textile tools have been studied by Katarzyna Barska (2004).

Bronze Age

Our knowledge of Bronze Age textile production in the Polish territories is relatively limited. No textiles preserved in their original, organic state have been discovered thus far.



Impressions of fabrics on pottery, made during the production process, are the only finds we have at our disposal. All of the imprints are of tabbies made of z-twisted threads. Finds from the villages of Zielonki and Modlnica near Kraków (Łaszczyńska 1966, 31–33) may serve as examples here (Fig. 14.1). Clay loom weights discovered on the sites suggest that such textiles were woven on a warp-weighted loom. The weights were usually cylindrical with a hole pierced vertically along the length of the weight. Such finds are dated to the earlier phases of the Bronze Age and are known, for example, from Biskupin, a site preceding the above-mentioned Iron Age fortified settlement (Gardawski *et al.* 1957, 200–202, Fig. XXVII: 1–4), or from Chrzastów, Zgierz powiat (county), where a number of weights were recovered (Maik 2002, 24–25, 18.2, Figs 2.1, 5.1–2).

Fig. 14.1. Zielonki near Cracow: tabby fabric imprints on clay, Bronze Age (After Łaszczyńska 1966).

Hallstatt Period

The earliest textiles preserved in their organic state from the territory of Poland are dated to the Hallstatt period and have survived due to the practice of inhumation, particularly in Silesia. Some fabrics were investigated before World War II (Sage 1934a; 1934b; von Stokar (n.d. a, b, c). The majority of these textiles do not differ considerably from the earlier Bronze Age imprints on pottery. Made of flax or wool, they are mainly tabbies with z-twisted warp and weft yarns, of about 0.3–0.8 mm in

Fig. 14.2. Jankowice,
Oława powiat: tabby
fabric, Hallstatt period
(After Sage 1934a).

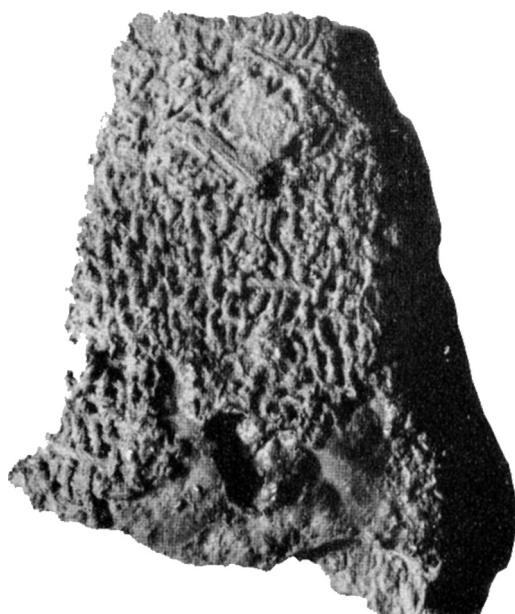
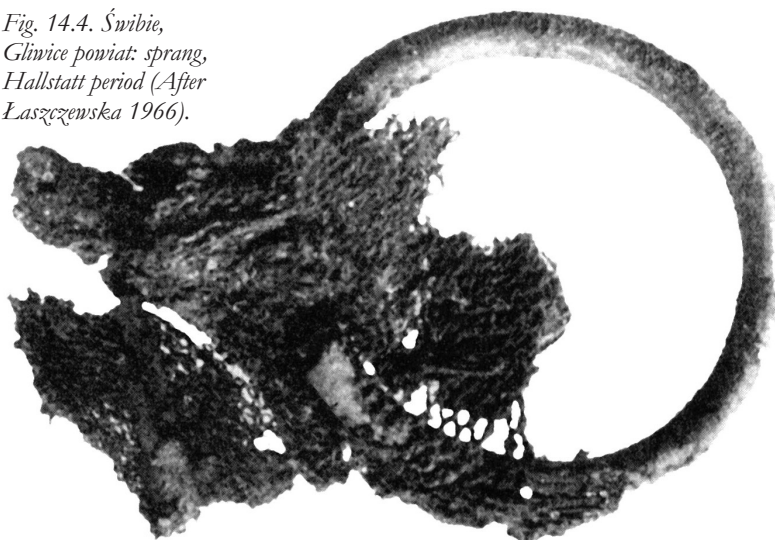


Fig. 14.3. Łódź: string
and fabric preserved on
sickles, Hallstatt period
(After Łaszczyńska
1966).



Fig. 14.4. Świbie,
Gliwice powiat: sprang,
Hallstatt period (After
Łaszczyńska 1966).



thickness. Most of the finds are from Silesia, e.g. from the village of Jankowice, Oława powiat (Fig. 14.2; Jungwitz, Kr. Ohlau),¹ Stare Kolnie, Brzeg powiat (Alt Köln, Kr. Brieg), Domaradz near Opole (Dammratsch, Kr. Oppeln), Wołów, Wołów powiat (Wohlau-Ost, Kr. Wohlau), Łabędy-Przyszówka, Gliwice powiat (Woldenau, Kr. Gleiwitz), Lasowice Małe, Olesno powiat (Klein Lassowitz, Kr. Rosenberg; Sage 1934a, 71–73; von Stokar n.d. c).

The textile finds or their clay impressions dated to the Hallstatt period from outside Silesia are also tabbies. Such, for example, are the fabrics discovered on sickles found in Łódź (Fig. 14.3), the impression of a fabric on a piece of baked clay from Biskupin (Łaszczyńska 1966, 34–35) and a large number of fabric impressions visible on urns from the burial ground at Maciejowice, Siedlce powiat, Mazovia (Maik 1990). Variations of plain weave include rep and half-basket weaves, for instance, from Mąkolice, Piotrków Trybunalski powiat (Maik 1995). A tablet weave is known from Zakrzew, Sieradz powiat, where a band woven with at least 21 tablets was found (Maik 2005a, 227–228). A small fragment of a wool sprang (Fig. 14.4) comes from the village of Świbie, Gliwice powiat (Schwieben, Kr. Gleiwitz; Łaszczyńska 1966, 33, Fig. 10).

Several very interesting textile finds are known from the village of Domasław near Wrocław, where a large burial ground dated to the Hallstatt C period was excavated in 2006. The site is extremely rich in bronze, iron and gold objects. According to the excavators, many of these items have marked influences of the Hallstatt and Illyrian cultures. Among the numerous finds are three completely mineralised fragments of fabrics which have survived on iron objects, and a single textile impression on a piece of fired clay. Although the remains are currently being examined, we may already say that one of the samples, being a simple tabby, is typical of the Early Bronze Age in Poland. The second surviving textile, imprinted on clay, was made in 2/2 twill (Fig. 14.5), while the last specimen seems to have been made in some variation of 2/2 twill, either broken or diamond twill (Fig. 14.6; Maik 2007). These are the oldest finds of this weave discovered thus far on the territory of Poland. Analogies have been found in the Hallstatt culture area, in the famous salt mines of Hallstatt and Dürnbereg

near Hallein, Austria (Hundt 1959; 1960; 1961; 1967; Bender Jørgensen 1992, 107; Grömer in this volume), where twills are known in the Bronze Age.

Based on these scarce finds from Silesia, it is hardly possible to determine whether the fabrics were imports, or whether the production of twills had already begun here at that time as a result of many cultural ties with the Hallstatt region. However, taking into consideration the numerous Hallstatt imports found at Domasław mentioned above, the fabrics could also have been imported, brought to the site as commodities or as articles of clothing belonging to people who arrived in Silesia from what is now Austria.

La Tène Period

Fabrics dating to the La Tène period are very rare in Poland. The only ones known come from the village of Głownin, Strzelin powiat (Glofenau, Kr. Nimptsch; Sage 1934a, 73–74). They were found in graves equipped with objects characteristic of Celtic culture and are all wool tabbies (Fig. 14.7).

It may be assumed that local textile production in the Hallstatt and La Tène periods did not differ from that of the Bronze Age. The fabrics were simple tabbies woven on warp-weighted looms. The continuation of production from the Bronze Age through the Iron Age is further confirmed by the discovery of some loom weights. They differ in shape from the older artefacts, being truncated conical, but their function remained the same. Finds from Biskupin, Żnin powiat (Gardawski 1979, 267, Fig. 151.3), Chabielice, Bełchatów powiat (Frąsiak *et al.* 2000, 74, 50.6–7), and Chrzastów, Zgierz powiat may serve as examples here (Maik 2002, 52, Fig. 42.4).

Roman Period

Our knowledge of textile production in the Roman period is more advanced, primarily due to the more frequent occurrence of inhumation graves, where fabrics have survived in mineralised form on iron objects. Burials of this type are especially common in the Wielbark culture area. Fabrics have been found in at least 35 Wielbark culture cemeteries. The largest textile collections derive from cemeteries in Pomerania, mainly from Gronowo, Drawsko



Fig. 14.5. Domasław near Wrocław: 2/2 twill fabric, Hallstatt period (Photo: J. Maik).



Fig. 14.6. Domasław near Wrocław: broken or diamond twill fabric, Hallstatt period (Photo: J. Maik).



Fig. 14.7. Głownin, Strzelin powiat: tabby, La Tène period (After Sage 1934a).

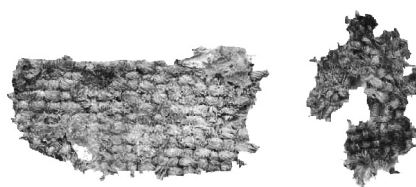
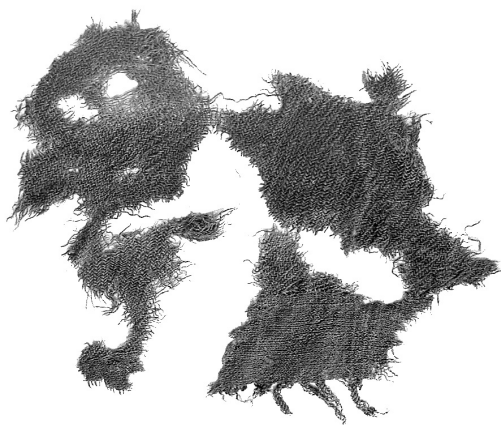


Fig. 14.8. Ulkomy, Gdańsk powiat: linen tabby, Roman period (Photo: J. Strobin).

Fig. 14.9. Leśno,
Chojnice powiat: 2/2
twill wool fabric with
tubular selvedge, Roman
period (Photo:
K. Karpińska).



Fig. 14.10. Gronowo,
Drawsko powiat: 2/2
twill wool fabric with
tablet-woven finishing
border and fringes,
Roman period (Photo:
K. Karpińska).



powiat, Grzybnica, Koszalin powiat, Leśno, Chojnice powiat, Lubowidz (Luggewiese), Lębork powiat, Nowy Łowicz, Drawsko powiat, Ulkowy, Gdańsk powiat, Weklice, Elbląg powiat, and Węsiory, Kartusy powiat.

In northern Greater Poland, fabrics were recovered at the cemetery in Kowalewko, Oborniki powiat. In Mazovia, extant textiles are rare. Most of them were discovered at the burial ground in Jartypory, Węgrów powiat and in the so-called princely grave in Pielgrzymowo (Pilgramsdorf), Nidzica powiat. An interesting set of textiles comes from the Lublin district, from the cemeteries in Gródek on the Bug and Masłomęcz, Hrubieszów powiat, where a separate group of the Wielbark culture, referred to as the Masłomęcz Group, developed (Maik 1977; 1979; 1988; 2001a; 2001b; 2005b; 2005c; Sikorski 2001; von Stokar n.d. a, b). A small number of textiles were also found at the West Baltic culture burial grounds in Szwajcaria, Osowa and Żywa Woda, Suwałki powiat, north-eastern Poland (Nahlik 1958; Maik 1977).

As mentioned above, cremation burials were dominant in the Przeworsk culture and this is why so few textiles have survived in the area. The majority of finds come from Silesia, southern Poland, where they are found in inhumation graves. The largest and most interesting collection of textiles was found in the princely graves in Zakrzów (Sakrau), currently a district of Wrocław (Sage 1934b), and in the graves at Żerniki Wielkie (Groß Sürding) near Wrocław (Sage 1934a, 75–76). A small number of carbonised fabrics were discovered in a granary in Nowa Huta-Mogiła near Kraków (Tumalewiczowa 1957–58, 30–32).

The research conducted hitherto suggests that there were no significant differences with regard to the material or the production technique between the textiles of the Przeworsk and Wielbark cultures. Therefore, the textile production of both cultures will be further discussed together.

Owing to the fact that wool fabrics found in Poland are much better preserved than linen textiles, our knowledge of ancient textile production is extremely uneven. The examination of approximately 30 linen fabrics dated to the Roman period demonstrates that they were relatively delicate products, all made in tabby with z-twisted warp and weft threads (Fig. 14.8).

In contrast, about 500 fragments of wool textiles of Roman period have been discovered in Poland thus far. It should be emphasised that nearly all the pieces of clothing dating back to the Roman period are textiles of a high quality,

produced from very fine wool. Moreover, in about 30 % of the examined fabrics, the wool turned out to be finer than modern merino wool. The vast majority of the wool textiles are made in 2/2 twill (Figs 14.9–14.10). It is notable that in the Early Roman period (phase B) most such fabrics had z/z-twisted yarns, while in phase B2/C1 and throughout the later Roman period (phase C), most of them had z/s-twisted yarns. This seems to suggest a progressive development of textile production, as twill fabrics started to be made so as to have a more distinct structure. This tendency is even more noticeable in the case of fabrics made in 2/2 broken and 2/2 diamond twill (Figs 14.11–14.12). Only a few such textiles dated to the Early Roman period have z-twisted warp and weft yarns; all the later specimens were woven with a z/s twist combination. It is clear that the weavers intended to make the diamonds more visible, thus emphasising the complex structure of their textiles.

It may also be noted that checked and rectangle patterns of all types are highly characteristic for the Roman period, particularly the Wielbark culture textiles. They were produced in a variety of ways, *e.g.* by using coloured threads, by mixing the material (flax/wool), and by changing the direction of the yarn twist in both warp and weft.

Although archaeological textiles excavated today are mostly brown in colour, light and dark streaks of threads are visible in some cases. Chemical analysis proved that dyed threads were used to produce the colour effects. The find from Gronowo may serve as an example: here, brown-dyed and light, natural coloured threads were used to produce a checked pattern (Fig. 14.13; Cybulska *et al.* 2010). In the fabric found in Leśno, originally blue wool and linen threads were used, although the linen has not survived. As a result, today, the textile appears to be an openwork fabric (Fig. 14.14; Cybulska *et al.* 2010).

A beautiful example is that of a textile from Odry where a shiny, checked pattern was obtained by using z- and s-twisted warp and weft threads. It is a corner of a cloak known as a *Prachtmantel* in scholarly literature (*e.g.* Schlabow 1962). It was a rectangular, blue cloak with tablet-woven borders on its four sides, worn around the shoulders. The finishing border and the corners have plaited fringes (Fig. 14.15). Textiles of this type are especially

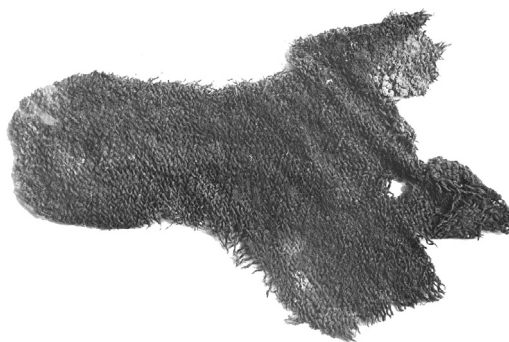


Fig. 14.11. Gronowo, Drawsko powiat: 2/2 diamond twill wool fabric, Roman Period (Photo: K. Karpińska).



Fig. 14.12. Żerniki Wielkie near Wrocław: diamond twill fabric, Roman period (After Sage 1934a).



Fig. 14.13. Gronowo, Drawsko powiat: 2/2 twill checked wool fabric with tablet-woven finishing border and fringes, Roman period (Photo: K. Karpińska).

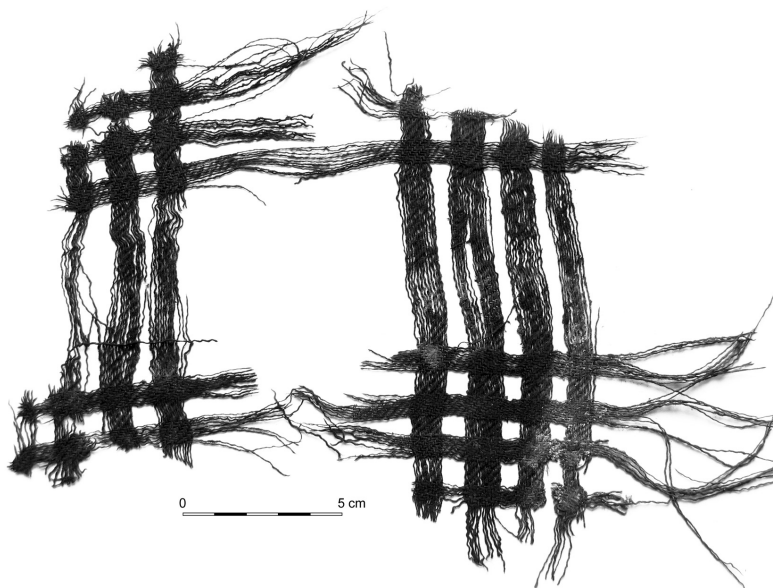


Fig. 14.14. Leśno, Chojnice powiat: 2/2 twill fabric, originally made from flax and wool threads, Roman period (Photo: K. Karpińska).

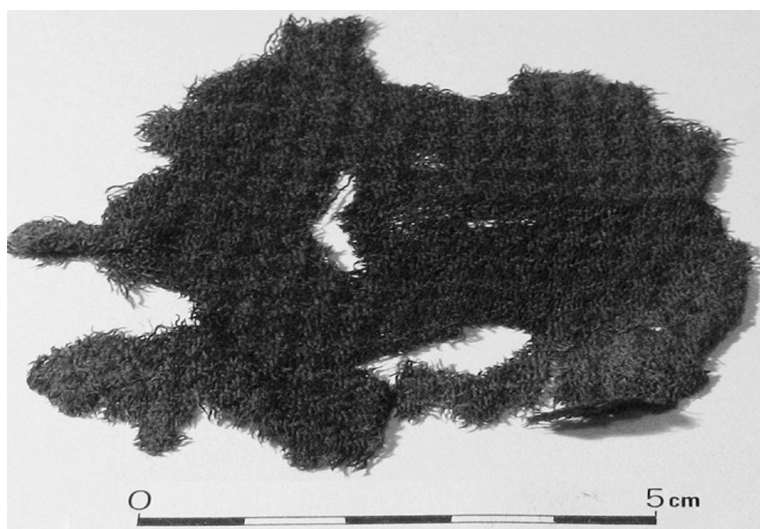


Fig. 14.15. Odry, Chojnice powiat: corner of a wool mantle (Prachtmantel) – Odry type fabric with tablet-woven selvedge, finishing border and fringes, Roman period (Photo: K. Karpińska).

Fig. 14.18. (right) Zakrzów near Wrocław: wool tabby with tablet-woven border (After Sage 1934b).

characteristic of Pomerania (Fig. 14.16). A large number of such fabrics were found at cemeteries in Nowy Łowicz and Odry, hence Bender Jørgensen classified them as Odry type (1992, 127).

Besides 2/2 twills, a large number of tabbies dating to the Roman period have been recovered (Figs 14.17–14.18). It should, however, be noted that regardless of the weave, all the Roman period textiles found in Poland are products of a high or even

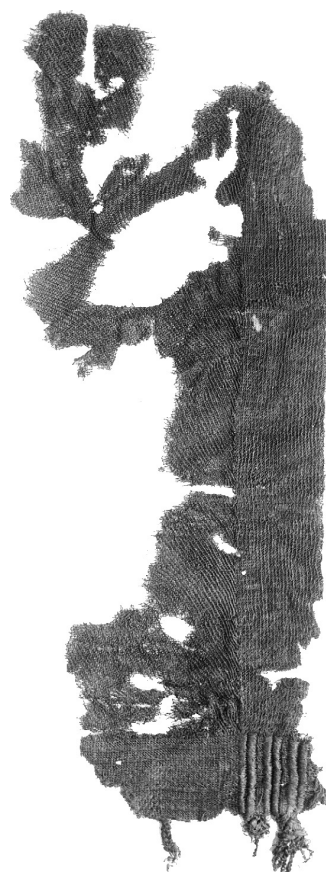
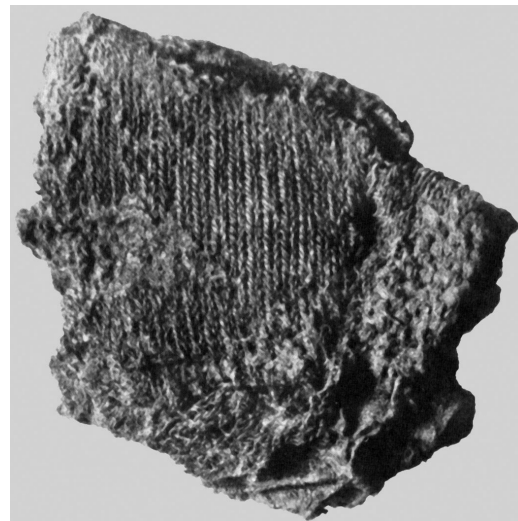
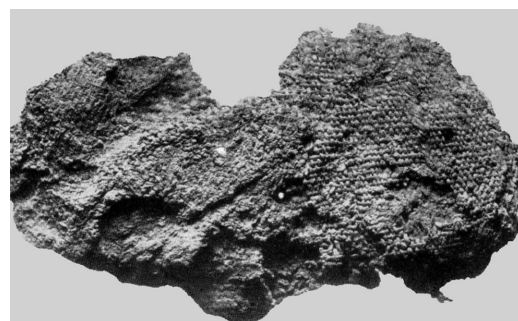


Fig. 14.16. Nowy Łowicz, Drawsko powiat: Odry type wool fabric, Roman period (Photo: J. Maik).

Fig. 14.17. (below) Zakrzów near Wrocław: wool tabby (After Sage 1934b).



very high quality. Many of them have over 20 warp and weft threads/cm. Thread thickness usually varies between 0.3 and 0.6 mm and it is sometimes less than 0.2 mm. They all seem to have been made on a warp-weighted loom; at least no evidence of the use of a loom with tubular warp has been found (*cf.* Mannering *et al.* in this volume). The hypothesis that warp-weighted looms were used is confirmed by the starting borders preserved in some cases, and by finds of loom weights. The loom weights discovered in the Wielbark culture area have either a flat, round shape with a central hole or a conical shape with a horizontal hole. More interesting specimens come from the Przeworsk culture area. In Ożarów Mazowiecki, near Warsaw (Barska 2004), in a hut dated to the Early Roman period, 28 or 29 conical loom weights were discovered lying in two rows approximately 3.75 m wide (*cf.* Belanová-Štolcová in this volume). Two loom weights were particularly large. If they represent the remains of a warp-weighted loom, it must have been more than 3 m wide.

Other sets of loom weights come from Piwonice, today a district of Kalisz (Dąbrowski 1958, 71–73) and Toporów, Wieluń powiat (Ząbkiewicz-Koszańska *et al.* 1963, pl. 56.1, 3). On these sites, sets of conical loom weights, 18 and 15 objects respectively, were found in the earth fill of the huts. Dated to the beginning of the Migration period (*c.* AD 375–450), they prove that the warp-weighted loom was in use in the Polish territories throughout the Roman period. Compared to the number of weights from Ożarów Mazowiecki, the number of loom weights from Piwonice and Toporów suggests that the looms they formed part of must have been narrower, about 100–200 cm in width.

The contact between the Roman Empire and the peoples inhabiting the territory of Poland at the beginning of the Common Era is attested by numerous archaeological finds that undoubtedly originated from Roman territories. It is likely that textiles could also have been imported. Thus, in the princely graves from Zakrzów and Pielgrzymowo (Fig. 14.19a–b), dated to the end of the Roman period, meagre remains of a wool, knotted-pile carpet were found (Sage 1934b, 278; Fuhrmann 1939–40, 322–327). A similar carpet, dated to the 1st century AD, was found in Palmyra, Syria (Maik 1994). In addition,

Fig. 14.19. Zakrzów near Wrocław: rug knots, Roman period (a. after Sage 1934b; b. after Fuhrmann 1939–40).

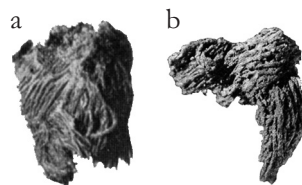


Fig. 14.20. (below) Leśno, Chojnice powiat: Vurring type wool fabric, Roman period (Photo: K. Karpińska).

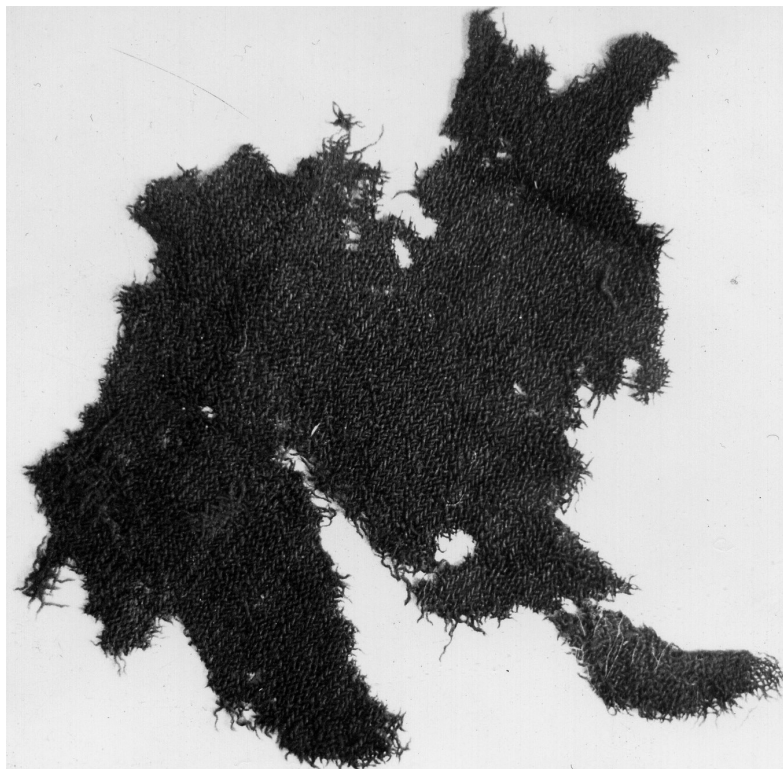


Fig. 14.21. Odry, Chojnice powiat: Moguntiacum type wool fabric, Roman period (Photo: J. Maik).



among the textiles from Pielgrzymowo was a find referred to as a 'trace of silk'. It is highly probable that these textiles were imports from the Roman Empire. Furthermore, according to Lise Bender Jørgensen, the high quality fabrics made in a variation of 2/2 diamond twill (Fig. 14.20) found to the north of the Limes and known as the Virring type (after a find from northern Jutland, Denmark) are also Roman imports (Bender Jørgensen 1986, 346–348). Textiles made in another variety of 2/2 diamond weave discovered in the Wielbark culture area (Fig. 14.21), for which the only analogies are textiles from Roman Mainz (Wild 1970, 48, 116, Figs. 39–40; cf. Möller-Wiering and Subbert in this volume), may also belong to this group. These textiles are known as Moguntiacum type fabrics (Maik forthcoming).

It may be noted that, at least part of the wool used in Roman period textiles is of such high quality that it may have come from a particular Roman sheep, bred in the Empire (Maik 2004, 41). It is difficult to say how it reached the Barbaricum, whether in the form of live sheep, raw wool or ready-made textiles. Contacts with the Roman Empire may have exercised such an influence over the local economy that sheep with fine wool could have been bred on the territory of Poland.

The considerations outlined above seem to suggest that, during the Roman period, textile production in the territory of Poland was well developed and flourishing, although the tools and, above all, the loom used in the process did not differ from those known in the Bronze Age or the early stages of the Iron Age. The situation remained unchanged until the beginning of the Migration period as evidenced by the few archaeological textiles found in Pomerania. However, this was a time of the general decline of both culture and economy, including textile production. Although the Early Medieval fabrics found in Poland were still made in 2/2 twill weave, they lack the delicacy and finish so characteristic of the Roman period textiles.

Conclusions

The number of archaeological textile finds dating to the Bronze and the Early Iron Ages in Poland is too small to draw any general conclusions concerning the quality of fabrics

in these periods. It appears that simple tabbies were produced in wool and flax. However, the finds from Domasław suggest that twills, most probably imports, were also in use in the territory of present-day Poland already in the Hallstatt period. They may have provided a model for producing these more complex weaves locally. Undoubtedly, fabrics of this type were made in the Polish territories during the Roman period when the manufacture of textiles was already highly developed. The wool used was of a high quality and the fabrics were fine and beautiful. The influence of the Roman Empire on Roman period textiles is evident and imports from the Empire dating to the 1st century AD have also been found. During the Migration period, the manufacture of textiles declined, a tendency which continued throughout the Middle Ages.

Original text translated from the Polish by Zuzanna Poklewska-Parra.

Note

- 1 In order to simplify bibliographic search, the former German names of the sites are given in brackets.

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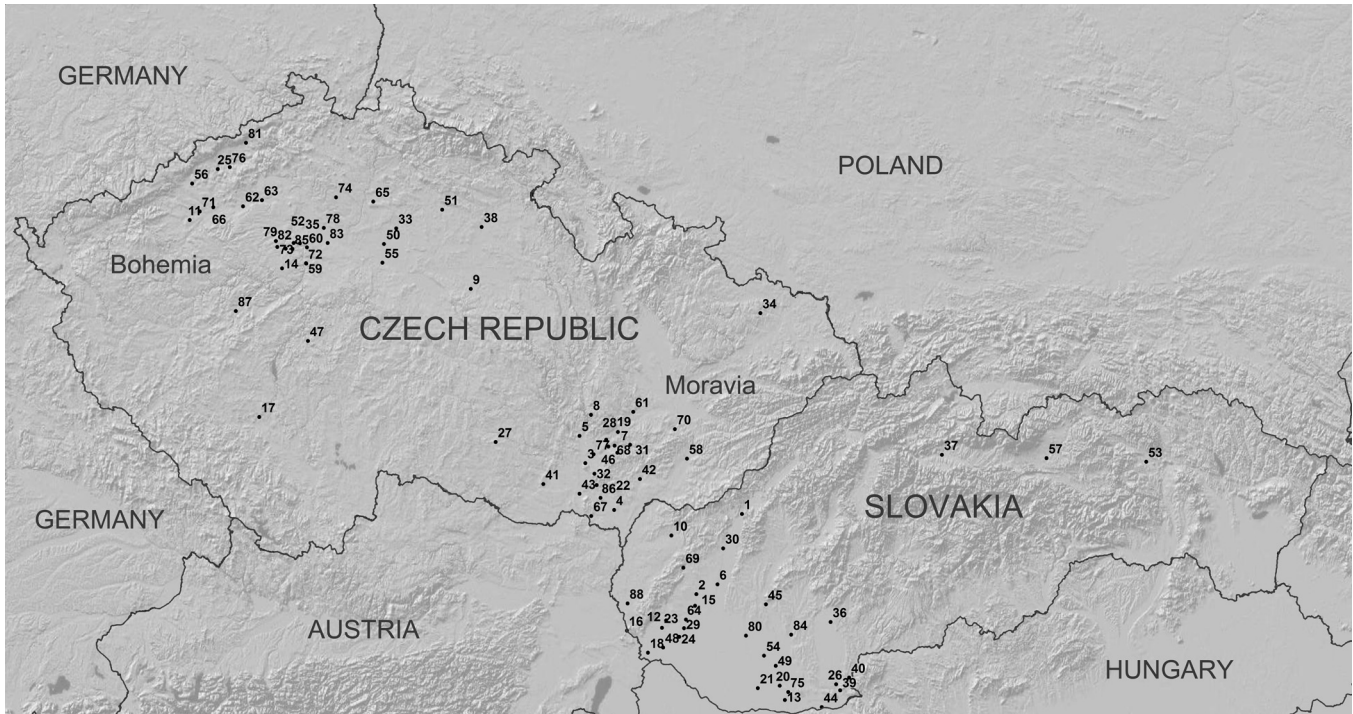
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SLOVAK AND CZECH REPUBLICS

Neolithic period	5500–2300/2200 BC
Bronze Age	2300/2200–800/750 BC
Hallstatt period (Ha)	800/750–480/450 BC
La Tène period (Lt)	450–1 BC
Roman period	AD 1–400
Migration period	AD 400–600

SLOVAK AND CZECH REPUBLICS



Map 15.1. Slovak and Czech Republics. Sites mentioned in Chapter 15:

1 Beckov	23 Ivanka pri Dunaji	45 Nitra-Malý Seminár	67 Sedlec
2 Biely Kostol	24 Janíky	46 Nížkovice	68 Slavkov u Brna
3 Blučina	25 Jenišův Újezd	47 Nová Ves u Kralup	69 Smolenice-Molpír
4 Břeclav	26 Kamenín	48 Nové Košariská	70 Soběsuky
5 Brno	27 Klučov	49 Nové Zámky	71 Staňkovice
6 Bučany	28 Komořany	50 Nymburk	72 Staré Město
7 Bučovice	29 Kostolná pri Dunaji	51 Obora u Hořic	73 Stehelčevy
8 Býčí Skála	30 Krakovany-Stráže	52 Okoř	74 Stránce
9 Bylany	31 Křenovice	53 Ostrovany	75 Svätý Peter
10 Čáčov	32 Křepice	54 Palárikovo	76 Světec u Bíliny
11 Čeradice	33 Křinec	55 Pečky	77 Telnice
12 Chorvátsky Grob	34 Kyjovice	56 Pohlody	78 Tišice
13 Chotín	35 Letky	57 Poprad-Matejovce	79 Třebusice
14 Chýně	36 Levice	58 Postoupky	80 Trnovec nad Váhom
15 Cífer-Pác	37 Liptovská Mara	59 Praha	81 Tuchomyšl
16 Devín	38 Ločenice	60 Přemyšlení	82 Tursko-Těšiny
17 Dobev	39 Malá nad Hronom	61 Pustiměř	83 Veliký Brázdím
18 Gerulata	40 Malé Kosihy	62 Radonice nad Ohří	84 Veľká Maňa
19 Holubice	41 Miroslav	63 Radovesice	85 Velké Přílepy
20 Hurbanovo-Abadomb	42 Mistrín	64 Reca	86 Zaječí
21 Hurbanovo-Bacherov Majer	43 Mušov	65 Řepov	87 Záluží u Čelákovic
22 Hustopeče	44 Mužla-Čenkov	66 Rvenice	88 Zohor

Slovak and Czech Republics

Tereza Belanová-Štolcová

Introduction

This chapter considers textiles and textile tools from the area north of the Middle Danube, *i.e.* predominantly from the territory of modern south-west Slovakia and the eastern part of the Czech Republic. In comparison with other European areas, no large corpora of textiles or complete articles of clothing have been found in the Slovak and Czech Republics. In most cases, small fragments of textiles have been preserved through mineralisation and corrosion on bronze and iron objects, such as swords and scabbards, lance-, spear- and arrowheads, knives, fibulae, belt rings and other metal objects (Fig. 15.1, and also see Figs 15.8–15.12). Textiles preserved in this way are found in graves, where they originally were deposited as clothing or served as wrappings of the artefacts. The majority of these textiles date to the La Tène period. In most of these finds, the organic material has usually disappeared, but due to the structure of the fabric or their position in the grave, much information can still be gathered. A very significant group of finds consists of hollow bronze anklets filled with textiles. Furthermore, impressions of textiles, cordage or basketry on ceramics

– impressed intentionally for decorative purposes or by accident during the production process – occasionally occur throughout prehistory (Fig. 15.2).

An exception to the rule is represented by a recent Migration period find from Poprad-Matejovce, in northern Slovakia (Belanová and Pieta 2007; Pieta and Roth 2007; Štolcová *et al.* 2009; Zink 2009). Here, waterlogged soil conditions have preserved an almost complete wooden burial chamber covered with a roof, as well as all kinds of other organic materials, including leather, textiles and remains of wooden furniture (Fig. 15.3).

Although textiles are not very common in Slovakia and the Czech Republic, important complexes of textile tools preserved in their primary contexts provide valuable information about textile production throughout prehistory in this region.

Chronological and Cultural Background

Few of the finds considered here date to the Bronze Age; the majority are dated to the Early Iron Age (Hallstatt period), Late Iron Age (La Tène period), and to the Roman period,

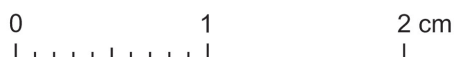


Fig. 15.1. Remains of a mineralised fabric in half-basket weave on the iron knife blade from Bučany, grave 7, Late Hallstatt–Early La Tène period (Photo: T. Belanová-Štolcová).

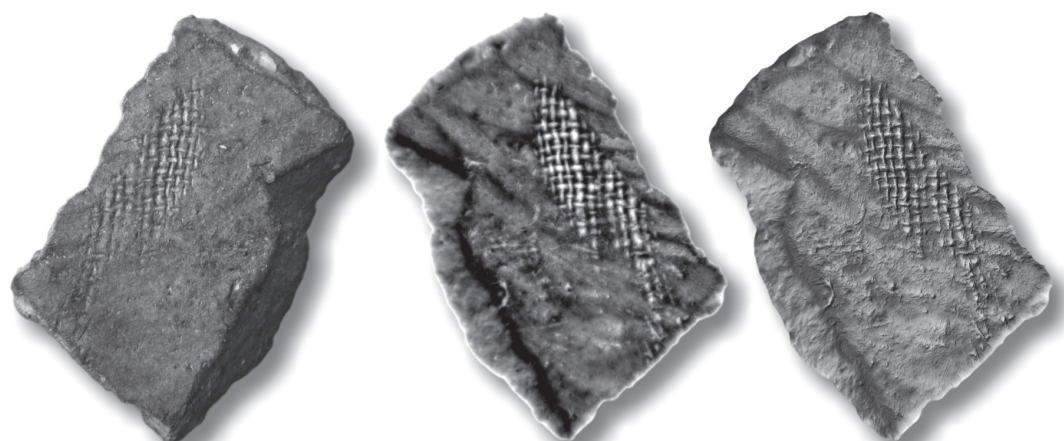


Fig. 15.2. Pottery sherd showing an unintentional impression of a gauzy tabby with π -spun threads in both systems and a thread count of 14/12. Germanic settlement in Beckov, 4th century AD. From left to right: original sherd, 3D depth image and virtual positive impression made by Reflectance Transformation Imaging/Polynomial Texture Mapping (Photo and processing: S. Štolc, courtesy of V. Varsík).



Fig. 15.3. (left) Layers of textiles, leather and wood in situ from the Germanic princely grave in Poprad-Matejovce, Early Migration period (Photo: T. Belanová-Štolcová).

Fig. 15.4. (right) Carbonised strings made of plant material, Hallstatt settlement Smolenice-Molpír (Photo: T. Belanová-Štolcová, courtesy of the Archaeological Institute of the Slovak Academy of Sciences).

covering the time span from c. 8th century BC to the 4th century AD.

The chronology of the Bronze Age (2300/2200–800/750 BC) in the area is divided according to Reinecke's system into Early (Bz

A), Middle (Bz B, Bz C – Tumulus culture) and Late (Bz D, Ha A, Ha B – Urnfield culture). Throughout the first half of the 8th century BC, a new civilization of the East and West Hallstatt culture developed from the earlier

Bronze Age Urnfield culture (phase Ha B) in the broad geographical area between eastern France and western Hungary (Reitinger 1981, 9–10). In general, the Hallstatt period covers the time span of 800/750–480/450 BC, *i.e.* phases Ha C and Ha D (Belanová *et al.* 2007, 421). The fertile plains of the Middle Danube region in the north-west Carpathian Basin, notably the territories of south-west Slovakia, Austria and west Hungary, belonged to the East Hallstatt culture (Stegmann-Rajtár 1992; Nebelsick 1997), where numerous important hilltop and lowland settlements as well as cemeteries have been identified. They belong to the Kalenderberg group which extended into east Austria, north-west Hungary, and the western part of south-west Slovakia (Kaus 1981). The centre of the Kalenderberg expansion to the north of the Danube River was the territory between the Little Carpathian mountain range and the river Váh (Stegmann-Rajtár 2002, 254–255, Fig. 1). The hilltop settlements were situated in strategic locations of long-distance trading routes going from the south-east Alpine Hallstatt region to the north (Stegmann-Rajtár 2002, Fig. 6). Settlements and cemeteries in this area hence reflect diverse cultural influences and contacts not only with neighbouring but also with far more remote areas (Stegmann-Rajtár 2005b, 60). The stable development of the Hallstatt culture in the entire north-east circum-Alpine area was, at the beginning of the 6th century BC, disturbed by the appearance of the new ethnic groups of nomadic (Scythian) origin (Studeníková 1993, 139).

Towards the very end of the Hallstatt period (500–450 BC), the first Celtic groups emerged in the broad area of western and central Europe, heralding the onset of the La Tène period. From their homeland between the Alps, the River Rhine and the Bohemian Forest, Celts colonised the area from the British Isles to the Iberian Peninsula, from Silesia to the Mediterranean Sea and from the Atlantic to the Carpathians, expanding as far as Asia Minor (Pieta 1996, 21; Bujna 2005, 1). The 5th century BC (phase Lt A) is characterised by the Early La Tène style, represented in chieftain graves in Germany and France (Megaw and Megaw 2001, 51). As in the rest of central Europe, the La Tène period (*c.* 450–1 BC) in the Czech and Slovak Republics is divided according to Reinecke's

system into Lt A (Early), Lt B (Old), Lt C (Middle) and Lt D (Late). Depending on the local developments, the relative chronologies vary slightly in their substages (*cf.* Bujna 2003, 44; Čížmářová 2004, 99; Waldhauser 2001, 41). In the territory of the Middle Danube, the first large Celtic settlements appeared in the first half of the 4th century BC and, from the turn of the 3rd century BC, Celtic groups advanced from south-west Slovakia towards the east and north of the country (Bujna 2005, 2–3). Most characteristic for the Middle Danube region is the presence of the so-called flat Celtic inhumation graves, which spanned Lt B1–Lt C1, from about 380 to 180 BC (Bujna 2004, 321). Representative for this region are rich warrior burials equipped with swords, lances, and shields, and female graves with new types of brooches, as well as special paired anklets or bracelets.

In the 2nd century BC, during the Late La Tène period, changes took place in the economic and political spheres of life, which are attested by the appearance of large fortified settlements – *oppida*. Crafts and trade were highly developed on these sites, and production of artefacts became more standardised. The first written sources and coinage from the territory of the Czech and Slovak Republics date to this period.

The turn of the Common Era in central Europe is characterised by further expansion of the Roman Empire. The chronology of the Roman period in Slovakia is based on Egger's system (Eggers 1951; 1955), slightly modified by Kolník (1971) into the Early Roman (B1, B2, B2/C1) and Late Roman period (C1, C2, C3), followed by the Migration period (D1, D2 and D3). The economic and social structure of the Celtic culture comes to an end with the Roman period and new ethnic groups, primarily Germanic Marcomanni and Quadi appear in the Middle Danube region (Kolník 1980, 197). The boundaries between the Germanic territory and the Roman Empire were marked by a defence system of fortifications – *Limes Romanus*. The situation in southern Moravia and south-west Slovakia was similar to northern Europe: here was the frontier of the Roman Empire, where Germanic people had settled. Only a small part of present-day Slovakia (the military camp Gerulata-Rusovce) belonged to the Roman province, Pannonia. During the Roman period, south-west Slovakia became a strategic location

mediating the contacts between the Roman world and the Barbaricum. Wine, luxury objects and other Roman products crossed the frontiers of the provinces to the Germanic inhabitants. In Slovakia, this is attested by rich princely graves, *e.g.* in Krakovany-Stráže (Ondrouch 1957) or Ostrovany (Prohászka 2006).

In the 4th and early 5th centuries AD, after the decline of the Roman Limes, new groups from the east settled in the Middle Danube region, notably Huns and Goths, starting a new epoch, known as the Migration period. It ended after the last of the Germanic tribes (Longobards) left central Europe and when the Avars appeared in Pannonia in the 6th century AD (Kolník 1980, 197).

Research History

The history of textile research in Slovakia and the Czech Republic goes back to the late 1950s and 1960s, when mineralised textile remains were first documented on metal artefacts found in graves (*e.g.* Kraskovská 1959, 128–132; Hrubý 1968–69). Subsequently, Marie Kostelíková conducted an extensive study on textiles from Moravia (1973). She also analysed material of various periods from the Czech Republic (*e.g.* Kostelníková 1978; 1985; 1988; 1990a; 1990b; 2002a; 2002b). Helena Březinová has followed in Kostelníková's footsteps, mainly focusing on medieval textile production in the Czech Republic (Březinová 1996; 1997; 2007a). More recently, Kristýna Urbanová has focused Czech textile research on textile fragments dated to the Roman and Migration periods (Urbanová 2008a; 2008b; Březinová and Poppová Urbanová 2009). In Slovakia, a greater interest in archaeological textiles began in the 1980s, when the finds of hollow bronze anklets filled with textiles dated to the Early and Middle La Tène period (Lt B–Lt C) came to light. These were studied in detail by Karol Pieta (1992), the pioneer of textile studies in Slovakia. He summarised the knowledge on prehistoric textiles of Slovakia in a popular book about the history of clothing (Furmánek and Pieta 1985). Lise Bender Jørgensen included Hallstatt and La Tène textiles of the Slovak and Czech Republics within the broader context of north and central European research (Bender Jørgensen 1992a). Slovak and Czech finds from the same periods

were also used as parallels in studies of Austrian and German textiles of Hallstatt and La Tène periods by Katharina von Kurzynski (Sankot and von Kurzynski 1994; von Kurzynski 1996) and Johanna Banck-Burgess (1999). Following the work of Pieta, the present author has been revising older Iron Age material and analysing new finds (Belanová 2005a; 2005b; 2007). In recent studies, more attention has also been paid to textile tools, namely spindle whorls and loom weights, which deepens our understanding of textile production during late prehistory and early history in the territory of Slovakia (Belanová *et al.* 2007; Belanová-Štolcová and Grömer 2010; Štolcová and Kolník 2010).

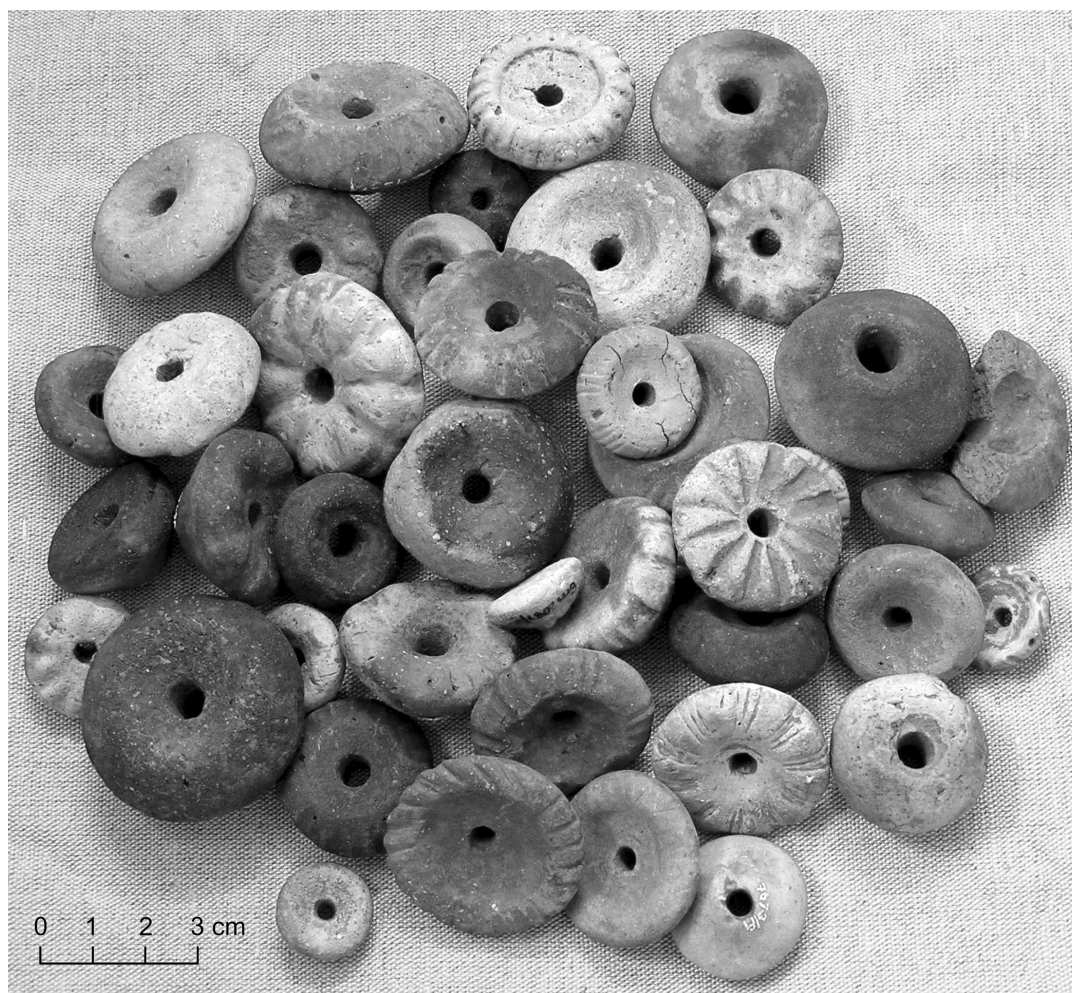
Bronze Age

Several Bronze Age finds of woven fabrics are known from the Czech Republic. The first comes from the Early Bronze Age cemetery of Kyjovice (Peška, Králík and Selucká 2006, Abb. 30, 31, 51), where mineralised imprints of skin, leather, insects, wood and textiles have been found. Some graves contain textile remains, but most of them are too deteriorated to see their structures. One find is a tabby with 0.3 mm thick Z-plyed yarns. It is of the same date as the textile attached to a bronze bracelet from Tursko-Těšiny. The textile has a very dense thread count of 4/7 threads/cm, S2z-plyed yarns in both systems and 0.8–2 mm thick threads made of animal fibre (Vykouková *et al.* 2007, 216–219). Another is a Late Bronze Age (Ha A1) sword with S-plyed yarn on it, which was found in Čeradice, district Bezirk Žatec, in north Bohemia (Grömer and Mödlinger 2005, 54, Abb. 4–6).

The find from the settlement at Staré Město is dated to the Late Bronze Age (Ha A). It is a fine wool textile with 18–24 threads/cm (Hrubý 1968–69, 51–58) and a spin pattern with alternating 1 z-twisted yarn and 1 3Z-plyed yarn in one system. The use of plyed yarn creates a fine ribbed surface and is the earliest instance of a 3-ply yarn used for weaving in Europe.

Fibre materials were also used for the decoration of pottery, as for example on a clay amphora from Mužla-Čenkov (Slovakia), dated to the Middle Bronze Age (*c.* 1450 BC). The decorative motif was created by impressing a bundle made of four z-twisted strings, each

Fig. 15.5. Selection of spindle whorls from the fortified hilltop settlement of Molpír by Smolenice, Hallstatt period (Photo: T. Belanová-Štolcová, courtesy of the West-Slovakian Museum in Trnava).



1.5–1.8 mm thick onto the surface of the vessel (Furmánek and Pieta 1985, Figs 9–10).

Hallstatt Period

One of the few textile finds dated to the Hallstatt period in Slovakia consists of some carbonised remains of a cord from Smolenice-Molpír. The cord is Z2s-plyed, single threads being about 1.5 mm thick and the complete cord has a thickness of 2.5–2.8 mm (Fig. 15.4). These fragments were originally determined as wool (Furmánek and Pieta 1985, 48; Bender Jørgensen 2005, 141), but the latest analyses have proven that they are of plant material, most probably flax (Belanová 2007, note 27).

The variety of textile techniques and twill weaves known from the Hallstatt period salt mines in Austria (*cf.* Grömer in this volume) can only be hypothetically expected in the territory of the Slovak and Czech Republics. A tiny textile fragment from Pustiměř is one of

the few examples. It is a 2/2 twill with groups of 2–3 s-twisted threads alternating regularly with z-twisted ones in both systems. A thread count of 30/30 threads/cm indicates the relative fineness of the fabric (Kostelníková 1990b). Another important find from the Hallstatt period is the assemblage from the Moravian cave, Býčí Skála, where carbonised fragments of felt, a ball of wool, baskets made of birch twigs and various mats were found in the rich burial place (Rast-Eicher 1995). Mineralised textiles are also known, as in the case of Rvenice (Bohemia), where a linen tabby was preserved on the edge of a bronze vessel dated to the Ha C/Ha D phase (Pleinerová 1973, 295, Fig. 7.2). In Bylany, a textile served as a wrapping for a bronze bracelet and an iron ring. It is a linen tabby with a thread count of 10/10 threads/cm (Slabina and Vykouková 2006, 94–95).

Due to the scarcity of textiles dated to the Hallstatt period, it is important to look for other sources of information on textile craft,

especially since there is evidence of a well-organised and developed textile production and trade starting at the beginning of the 1st millennium BC (von Kurzynski 1996, 26). The evidence consists of large quantities of textile tools found in primary contexts. Two sites that provide important information on textile production during the Hallstatt period in Slovakia are the hilltop settlement Molpír by Smolenice and the lowland settlement in Nové Košariská.

Smolenice-Molpír

The fortified hilltop settlement Molpír by Smolenice has a special position in the north-east Alpine Hallstatt region. Strategically situated on the eastern slope of the Little Carpathians, it was an important meeting place for northern and southern cultural influences. After systematic excavations in the 1960s and 1970s (Dušek and Dušek 1984; 1995), a closer revision of the ceramics and small finds has been made in several preliminary studies (e.g. Stegmann-Rajtár 1998; 2001; 2005a; Belanová 2007, 41–43). The most significant settlement phase dates to the developed Hallstatt period (Ha C2–Ha D1), *i.e.* from the 2nd half of the 7th century until the beginning of the 6th century BC (Stegmann-Rajtár 2005a, 152), although Molpír was inhabited during various periods of time from the Neolithic until the Middle Ages (Dušek and Dušek 1984, 78; 1995, 71).

Molpír was built on an area of approximately 12–14 ha in size. It is divided into three areas: an acropolis on the top, which was fortified by an earth and timber rampart and contained the main settlement, and two adjacent fortified areas below (Dušek and Dušek 1984, 9). On the inner side of the rampart, there were dwellings built side by side (62 houses all together). Two gates, a round tower, a cult place, seven hearths and one cistern were unearthed as well (Stegmann-Rajtár 1998, 263). The amount of finds uncovered on the acropolis is impressive – there are over 3000 small finds and more than 500 complete ceramic vessels (Stegmann-Rajtár 2005a, 146). Most importantly, about 2100 spindle whorls (Fig. 15.5) and nearly 200 loom weights were found in different houses on the acropolis.¹

Spindle whorls were found in every house of the hill fort. The analyses, conducted on the basis of a limited number of complete spindle

whorls (1955 items), have shown that their weight ranges from 3 to 63 g with an average weight of approximately 16 g. Those under 3 g were included in the statistics as well. The range of weights of these spindle whorls corresponds well to the thickness of the threads (from 0.1 to 0.6 mm) known from the Hallstatt period elsewhere (*cf.* Grömer 2005, 110–111, Fig. 6). It seems that primarily very fine threads were produced at Molpír, as the prevalent weight within the assemblage has a range of 3–28 g (*cf.* Belanová-Štolcová and Grömer 2010, fig. 3.5). Houses with higher quantities of spindle whorls form clusters throughout the entire inhabited area. Furthermore, they occur in high number (20 and more) in two- and three-room houses. Within these clusters, concentrations of loom weights of a truncated pyramidal shape have been found. They occur in 15 houses, and in at least two of them *in situ* finds of loom weights discovered in two lines signal the presence of warp-weighted looms (Dušek and Dušek 1995, 14, 49, 59; Belanová *et al.* 2007, 431; Stegmann-Rajtár 1998, Tab. 1). In the collection of loom weights, there are about 50 small pieces of flat discoid shape with the weight ranging between 45.6–157.9 g.² They support the idea that very fine fabrics woven with thin threads were also produced here.

Like spindle whorls, loom weights also occur in two-room houses, suggesting that these were places specialised in spinning and weaving, the so-called ‘weaving houses’ (Teržan 1996, 507; Stegmann-Rajtár 1998, 268). There is one anthropomorphic and one zoomorphic loom weight from house 17, both interpreted as idols (Stegmann-Rajtár 1998, 278–282). Furthermore, several single, unusually shaped or decorated loom weights were found, *e.g.* a weight with an incised moon-shaped pattern from the cult place or another one with a hole bored alongside its horizontal and vertical axes from house 18 (Stegmann-Rajtár 1998, Figs 3, 7, Table 2). Together with the two weights with figural motifs, they have close parallels in the south-east Alpine Hallstatt region (*e.g.* at Kleinklein, Poštela, Rifnik; *cf.* Stegmann-Rajtár 1998, Fig. 1). Loom weights found in the cemeteries from the same area (Teržan 1996, 514) also indicate symbolic connotations of weaving at this period.

The discoveries at Molpír are crucial to an understanding of the Hallstatt settlements – there are no other contemporary sites

with such a large number of spindle whorls. A comparable quantity of loom weights (120) was found in the hilltop settlement of Burgstallkogel by Kleinklein in Steiermark, Austria dated to the Hallstatt period (Dobiat 1990, 50–60; Grömer in this volume). Reconstruction work has demonstrated that they could easily be part of a warp-weighted loom on which a 3 m wide textile could have been woven (Dobiat 1990, 82–83).

The hill fort of Molpír with its unique position between two cultural spheres – northeast Alpine Hallstatt and the Lusatian culture – and its rich collection of finds of local as well as foreign origin demonstrates that the settlement definitely played a significant role in long-distance trade. Based on the analysis of these artefacts as well as rich burial mounds from these times, it is obvious that inhabitants of Molpír were elite members of Hallstatt society (Stegmann-Rajtár 1998, 265). The textile tools found on the site indicate that fine textiles and clothing of high quality could have been produced at the site and served to represent the power and status of its inhabitants. The enormous quantity of spindle whorls suggests that, spinning was in the hands of specialists, who were occupied with this activity on a full-time basis. They could be controlled by the patron, who desired to have the best quality products not only for his own use, but also for gift exchange and trade.

Nové Košariská

The knowledge of textile production in the Hallstatt period has been further enriched by a quite recent find from the lowland settlement in Dunajská Lužná, Nové Košariská. The site was first discovered in the 1960s, when five Early Hallstatt burial mounds dated to 750–600/550 BC belonging to the Kalenderberg Group and one mound dated to the Bronze Age were excavated (Pichlerová 1969). The princely Hallstatt period mounds contained rich grave goods: numerous ceramic vessels with figural depictions or geometric motifs, and plastic decoration including clay chains and animal protomes. The richest of them is tumulus VI, which contained a burial of a woman and possibly several children (Pichlerová 1969, 79–120). In addition to 81 ceramic vessels, there were also 12 pyramidal clay ‘supports’ in the first cremation, five more in a burial chamber, as well as a spindle

whorl and possible fragments of clay bobbins. The supports made of sun-dried clay have a flat truncated pyramidal shape and some of them have a hole in the upper part. Their average weight is about 200 g. These finds were interpreted as idols (Pichlerová 1969, 138) or symbolic loom weights (Teržan 1990, 175–176; Belanová *et al.* 2007, 424–425). Usually, loom weights are found in elite female graves, *e.g.* at Rifnik or Kleinklein (Teržan 1996, 513–514). Moreover, a small artefact interpreted as a ‘weaving shuttle’ has been found here (Pichlerová 1969, Table 38.10; Teržan 1990, 176; 1996, 516). The rich tumulus VI in Nové Košariská bears testimony to the high social status of a woman in the Hallstatt period within the Kalenderberg Group.

Part of a destroyed settlement was uncovered in 2002 and 2005, at a distance of only about 250 m from the necropolis. It included three pit houses of wattle and daub or log construction, a quarry pit, an oven and a building constructed of wooden posts (Čambal and Gregor 2005, 36, 44–51). The ceramic inventory of feature 1/02 has close parallels to the finds from Molpír and can therefore be dated between the end of phase Ha C2 and the end of Ha D1 (Čambal 2006, 58). Only a third of the house is preserved, but its original size can be estimated to have been at least 4.5 × 5.5 m (Fig. 15.6). Only north-east and south-east walls of wattle and daub construction could be documented. Apart from remains of pottery, worked antler and animal bones, as well as a fragmentary deer skull were found (Čambal and Gregor 2005, 37). In addition, 170 loom weights of truncated pyramidal shape with a hole in the upper part were found here (Fig. 15.7; Belanová *et al.* 2007). They were all made of sun-dried clay, bearing traces of the secondary burning. Based on their position within the house, the presence of at least two warp-weighted looms can be hypothesised. Along the south-eastern wall, a set of 91 loom weights (loom No. 1) formed a 4 m long line. They were larger, with an average height of 19 cm and weighed about 1.3 kg each. The second group consisting of 79 smaller loom weights (loom No. 2) was found in a 2 m long line by the north-eastern wall. Their average height is about 14 cm and they each weigh about 0.6 kg. Both sets of loom-weights included pieces with various marks in a form of a cross, circle and their combinations on the top parts (Table 15.1). The

marks on the loom weights do not seem to be connected to their size or weight. Regrettably, the exact position of marked weights within the lines is not known today. They could have been either production marks or could aid in pattern weaving. About 70 cylinder-shaped clay spools were found on the floor by the first set of loom weights. They all weigh approximately 150 g and are 8–9 cm long. No traces of wear or use have been observed, so their relation to the textile production in the house is unclear. However, similar objects common on Early Iron Age sites of Italy have been interpreted as weights for tablet weaving (Ræder Knudsen 2002, Fig. 104 and in this volume). Also, comparable objects have been found in the Hallstatt hill fort Poštela (Teržan 1990, Taf. 27, 12–29) and in grave 32 in Rifnik (Teržan 1996, Abb. 7.13).

There are several parallel finds of *in situ* looms from the East Hallstatt cultural area, e.g. at Ivanka pri Dunaji, Chorvátsky Grob and Stillfried (Belanová *et al.* 2007, 429–432, Fig. 6). The exact position of the loom is not always clear, but the number of loom weight concentrations is quite significant, e.g. in Praha-Hloubětín (Bohemia) where a set of 67 loom weights was found near a hearth (Soudský 1955, 196, fig. 89, 100–101; Venclová *et al.* 2008, 37). Wide looms comparable to loom No. 1 in Nové Košariská have been found recently in Freundorf (Blesl and Kalser 2005, 88) and Hafnerbach (Preinfalk 2003, fig. 12). They indicate that such large looms were not exceptional for centralised hill forts like Kleinklein (Dobiat 1990, 50–60).

It has always been assumed that only inhabitants of high social status lived on fortified hilltop locations, which were centres of power, economy and trade. In contrast, the lowland settlements situated on fertile lands of the Danubian Plains are thought to have been inhabited by communities of a lower social status who focused mainly on farming and craft production (e.g. Nové Košariská, Ivanka pri Dunaji and Chorvátsky Grob). Nevertheless, many rich graveyards of the Kalenderberg Group consisting mostly of barrows are situated in the vicinity of these lowland settlements (e.g. Nové Košariská, Reča, Janíky and Biely Kostol). The recent discovery of wide looms in lowland settlements like Nové Košariská, Freundorf or Hafnerbach suggests their greater importance and possibly higher

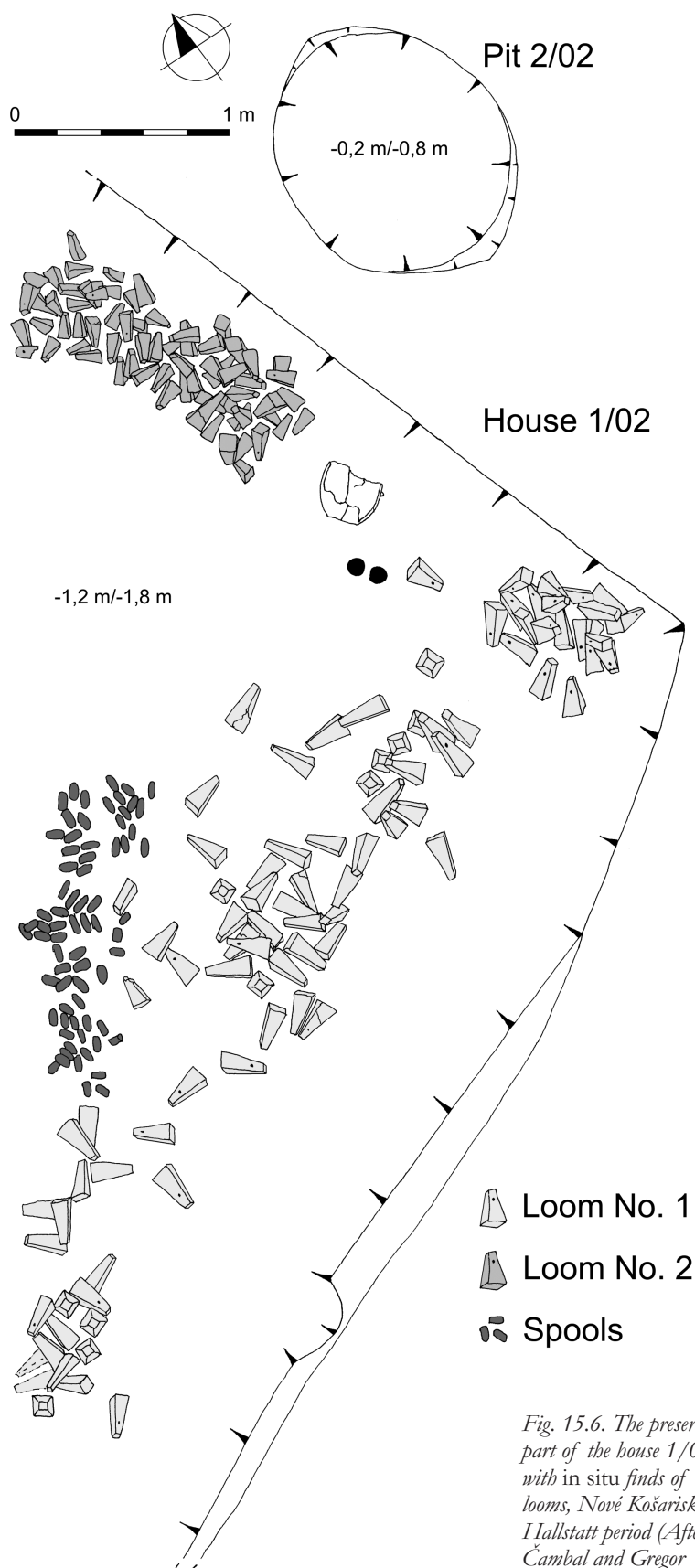
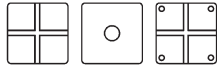
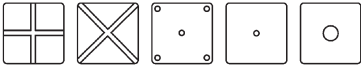


Fig. 15.6. The preserved part of the house 1/02 with *in situ* finds of two looms, Nové Košariská, Hallstatt period (After Čambal and Gregor 2005, 37).

Table 15.1. Basic measurements of the loom weights from house no. 1/02 at Nové Košariská, Hallstatt Period (Drawing: T. Belanová-Štolcová).

	Loom No. 1	Loom No. 2
Estimated width of the loom	4 m	1.8 - 2 m
Number of the loom weights	91	79
Average height of the loom weights	19 cm	14 cm
Average width of the base of the loom weights	10 cm	7 cm
Average weight of the loom weights	1.3 kg	0.6 kg
Types and count of marks on the loom weights	 4x 3x 3x	 6x 12x 1x 1x 8x

social status than previously thought. The find of the ‘weaving house’ at Nové Košariská points to a close connection between the settlement and the high-status burial mounds in its vicinity.

La Tène Period

The finds of loom weights from La Tène settlements in the Slovak and Czech Republics allow us to assume that the tradition of using the warp-weighted loom continued. There are significant finds from the area of Devín Castle (Belanová *et al.* 2005b, 106), Nitra-Malý Seminár (Březinová and Katkin 2004, 161), Pohľody (Vlčková 1991, 538), Dobeš (Dubský 1956, 42, Fig. 1) and Křinec (Sedláčková 1991, 230). Furthermore, the La Tène period provides a more abundant textile record in Slovakia, which is comparable to other finds from central Europe (Bender Jørgensen 1992a; 2005). Among textile finds from Slovakia, Moravia and Bohemia, two major groups of textiles can be distinguished. The first comprises textiles of primary use – small fragments adhering to the surface of metal objects. These pieces could be either from clothing or parts of various wrappings. The second group consists of textiles of secondary use that were reutilised for other purposes, as attested by the pieces of textiles found inside the hollow anklets.

As of 2007, the Slovak and Moravian textiles are represented by 149 finds from

105 graves in 30 cemeteries (Tables 15.2 and 15.3). The greatest number of textiles comes from the flat inhumation graves and only a few from cremation graves. As for the territory of Bohemia, textiles listed in Table 15.4 are used as material for comparison.

Slovakia

La Tène textiles from the territory of Slovakia are currently represented by 91 finds from 69 graves from 13 graveyards (see Table 15.2). Due to the replacement of organic matter by metal salts, a high percentage of textiles cannot be specified as regards the binding (32%) or the twist direction of yarn (33%). Where identification is possible, plain tabbies predominate (62%), compared to very sporadic occurrence of twills (5%). In 67% of finds, the raw material cannot be determined. All of the determinable material was identified as flax, with one exceptional hemp find from Palárikovo (Pieta 1992, 52). The cultivation of hemp in Slovakia throughout the La Tène period is attested by the recovery of hemp seeds (Hajnalová 1999, 69) and the find from Palárikovo proves its use for textiles. It is a twill fabric, 1.5 × 0.6 cm in size, with single s/s yarn and a thread count of 10/10 threads/cm (Opralová-Dolejšová 1987). Only one wool sample from Trnovec nad Váhom was identified among the recorded La Tène textiles from the territory of Slovakia (Bender Jørgensen 2005, 141). Nevertheless, comparison with wool material from the same cultural and

Site	Grave No.	Date	Description	Bibliography
Bučany , Kopanice (distr. Trnava)	7/78, 37/78	Ha D– Lt A	Finely woven textiles wrapped around iron knives: plain tabby and half-basket weave, z/z, diameter 0.25–0.4/0.35–0.5 mm, 14/22 threads/cm.	Bujna and Romsauer 1983, 282; Pieta 1992, 52; Banck-Burgess 1999, 223; Bender Jørgensen 2005, 141
Hurbanovo , Abadomb (distr. Komárno)	1/80	Lt C	Dense fabric mineralised on the surface of a bronze knobbed anklet, tabby, z/z, diameter 0.2–0.5/0.2–0.5 mm, 22/26 threads/cm, flax.	Opralová 1983a; Furmánek and Pieta 1985, 56, 125, fig. 52; Bender Jørgensen 2005, 141
Hurbanovo , Bacherov majer (distr. Komárno)	5, 11/80	Lt B–Lt C	Iron shears wrapped in the coarse fabric, tabby, z/z, diameter 0.4–0.5/0.4–0.5 mm, 6/5 threads/cm, flax; fine fabric twisted inside the bronze hollow anklet, tabby, z/z, diameter 0.6–0.8/0.6–0.8 mm, flax.	Benadik <i>et al.</i> 1957, 60, tab. XXI:5; Opralová 1985a
Chotín VIII (distr. Komárno)	6/75	Lt B2– Lt B2/C1	Twisted textile inside a bronze hollow anklets, not removed.	Opralová 1983b
Chotín X , Horná Panová zem (distr. Komárno)	3, 7, 12, 16, 21, 23, 28, 29, 30, 36, 37, 43, 47	Lt B1– 2/ Lt C1	Mineralised textiles on various iron objects: knives, razors, fibulae, belts and scabbards. Most of them are tabby, some 2/2 twill, z/z, diameter from 0.3/0.2–0.25 to 0.9–0.95/0.9–0.95 mm, from 5/5 to 18/24 threads/cm. Textiles on fibulae more dense and fine.	Opralová 1983b
Kamenín , Kiszölgy (distr. Nové Zámky)	8, 12, unknown grave	Lt	Textiles mineralised on the iron belt rings and iron fibula. Not analysed.	Benadik <i>et al.</i> 1957, 104, 106, 112
Malá nad Hronom , Rövid föld (distr. Nové Zámky)	unknown grave	Lt	Textile around the whole perimeter of two bronze arm rings, tabby, z/z, diameter 0.8–1 mm, flax.	Opralová 1983c
Malé Kosihy , Horné Konopnice (distr. Komárno)	257, 283, 331, 356, 396, 437A, 437B, 452, 456	Lt B1– 2/ Lt C1	Mineralised textiles on various iron objects: knives, razor, fibulae, belt fittings, arm rings, a buckle and a sickle. Not analysed.	Bujna 1995
Nové Zámky , Slovlik (distr. Nové Zámky)	9, unknown grave	Lt B2	Five fragments of fine fabrics rolled inside the paired bronze hollow anklets, tabby, z/z, diameter 0.6–0.8/0.3–0.6 mm, 20–24/12–14 threads/cm, flax, stitch holes after embroidery, selvedge. Another textile found on the surface of a bronze arm ring (grave unknown), tabby, z/z, diameter 2–2.5 mm, 14/13 threads/cm, flax.	Opralová 1983d, 1984a; Furmánek and Pieta 1985, 52–57; Pieta 1992; Banck-Burgess 1999, 60, 224–225, Abb. 24–25; Belanová 2005a, 177–181, figs 3–4; Belanová <i>et al.</i> 2005b, 123–131; Bender Jørgensen 2005, 141
Palárikovo , Dolný Keresztúr (distr. Nové Zámky)	1, 15, 24, 27, 38, 43, 50, 53, 58, 62, 62B, 77	Lt B–Lt C	Mineralised textiles on various iron objects: fibulae, belt fittings, a lancehead and a scabbard, tabby, 2/2 twill, z/z, diameter from 0.3–0.35/0.3–0.35 to 1–1.2/1–1.15 mm, from 7–8/7–8 to 10/10 threads/cm. Textiles inside some bronze tubular anklets are linen tabbies, z/z, diameter from 0.3–0.4/0.3–0.4 to 0.75–0.9/0.8–1 mm. An exception is the hemp twill textile from the grave 15 with s/s, diameter 0.75–0.9/0.8–1 mm and 10/10 threads/cm.	Benadik 1975; Opralová-Dolejšová 1987; Pieta 1992, 56; Banck-Burgess 1999, 225
Svätý Peter (distr. Komárno)	55, 58, 63	Lt B–Lt C	Fine textiles attached to the bronze fittings and inside the bronze tubular anklets, tabby, z/z, diameter from 0.3–0.5/0.4–0.5 to 0.5–0.6/0.5–0.6 mm, from 7/10–11 to 12/26–28 threads/cm, flax. Iron shears wrapped in textile woven in tabby, diameter 0.4–0.5/0.3–0.48 mm.	Dušek 1960, 459–461; Pieta 1992, 56; Banck-Burgess 1999, 223; Bender Jørgensen 2005, 141
Trnovec nad Váhom , Horný Jatov (distr. Šaľa)	233, 234, 362, 501	Lt	Mineralised textiles on iron scabbard and a knife, tabby, z/z, diameter from 0.6–0.7/0.7–0.8 to 0.9/0.8 mm, from 4/4 to 10/8 threads/cm, wool? and a linen string twisted in a bronze hollow anklet.	Benadik <i>et al.</i> 1957, 23, 25, 27, 33; Opralová 1985b; Pieta 1992, 56; Banck-Burgess 1999, 225; Bender Jørgensen 2005, 141
Veľká Maňa (distr. Nové Zámky)	11, 16, 32, 42, 75, 93/B, 100, 104, 111, 113, 115, 116, 125, 129, 138	Lt B1– Lt C1	Mineralised textiles on various iron objects: fibulae, belt fittings, a lancehead, a buckle and a ring, tabby, z/z, diameter from 0.2–0.25/0.2 to 0.45–0.5/0.45–0.5 mm, from 7/7 to 18/24 threads/cm. In grave 100 there were bronze rings threaded with S2z plied yarn, diameter 0.1–0.12 (single), 0.8–0.9 (plied) mm. In grave 113 linen S2z yarn was used to fill the bronze hollow anklets, diameter 0.1 (single), 8.5 (plied) mm. Other anklets contained linen tabbies, z/z, diameter from 0.5–0.8 to 0.7/0.5 mm, 16/8 threads/cm.	Benadik 1983; Opralová 1984b; Pieta 1992, 52; Banck-Burgess 1999, 224; Bender Jørgensen 2005, 141

Table 15.2. Assemblage of textile fragments found in La Tène period graves in south-west Slovakia.

Site	Grave No.	Date	Description	Bibliography
Blučina , Konopné zahrádky (distr. Brno-Venkov)	6, 11, 13, 16, 19	Lt B2	Mineralised textiles attached to a fibula, scabbard and a lancehead, tabby, 2/2 twill, z/z, diameter 1.4/0.76 mm, from 7/6 to 14/14 threads/cm, wool? Textiles from the bronze hollow anklets not removed.	Čížmářová 2004, 131–132; Belanová 2005a, 181, fig. 6; Bender Jørgensen 2005, 140
Brno-Maloměřice , Plíže (distr. Brno-mesto)	48, 67, unknown grave	Lt B1–B2/ Lt C1	Fine textiles twisted in bronze hollow anklets, tabby, z/z, diameter from 0.3–0.5/0.5 to 0.6–0.8/0.6–0.8 mm, from 12–13/9–10 to 16/18–13–14 threads/cm, flax, hemp?, stitch holes, selvedge. Mineralised textile on an iron object, z/z, 5/4 threads/cm, wool.	Bender Jørgensen 2005, 140; Belanová 2005a, figs 8–10; 2005b; 2007
Brno-Židenice , Tábořská ulice (distr. Brno-mesto)	unknown grave	Lt	Textiles mineralised on unknown iron objects: one is tabby, z/z, 12/19 threads/cm, wool? Another one has two layers: 1. tabby, z/z, 12/19 threads/cm, wool?; 2. 2/2 twill, 10/10 threads/cm.	Bender Jørgensen 2005, 141
Břeclav , Na Zvolencích (distr. Břeclav)	single grave	Lt	Mineralised textile wrapped around the iron scabbard, tabby, z/z, diameter 1.5–1.7/1.5–1.7 mm, 5/5 threads/cm, wool.	Bender Jørgensen 2005, 141
Bučovice , Lišky (distr. Vyškov)	14, 15, 20	Lt B	Mineralised textiles attached to bronze rings, fibula and torques, tabby, z/z, from 6/8 to 14/14 threads/cm, flax? Textile mineralised on iron object, tabby, z/z, flax?	Bender Jørgensen 2005, 140
Holubice , Dílce (distr. Vyškov)	8, 21, 35, 50, 56	Lt B2–Lt C1	Mineralised textiles attached to iron-bronze belt fittings, iron fibula and scabbard, half-basket weave, tabby, 2/2 twill, z/z and z/zz, diameter from 0.65–0.85/0.6 to 0.6–2.0/0.6–2.0 mm, from 5/5 to 18/15 threads/cm, wool.	Bender Jørgensen 2005, 140–141
Hustopeče , Šibenky (distr. Břeclav)	827	Lt B2–Lt C1	Two bronze knobbed anklets covered with textile from outer surface, tabby, z/z, diameter 0.5–0.7/0.5–0.7 mm, 10–12/10–12 threads/cm, flax.	Belanová 2007, 44, fig. 4
Křenovice , Přední díl (distr. Vyškov)	12, 17	Lt B	Mineralised textile on iron fibula, tabby, z/z, 6/5 threads/cm, wool? Mineralised textiles on two knobs of the bronze anklet, tabby, z/z, 13/13 threads/cm, flax/hemp?	Belanová 2005a, 182, fig. 7
Miřoslav , Nám. Svobody 3 (distr. Znojmo)	single grave	Lt B2	Textile twisted inside the bronze hollow anklet, tabby, z/z, diameter from 0.3–0.4/0.5–1 to 0.6 mm, 14–16/13 threads/cm, flax.	Kostelníková 2002a, fig. 1:2, 3
Mistřín , Trávníky, obec Svatobořice-Mistřín (distr. Hodonín)	7, 12, 14	Lt B1–Lt C1	Mineralised textiles on iron belt fittings and buckles and a bronze arm ring, tabby, z/z, S2z/z, diameter from 0.58/0.58 to 1–1.2 mm, from 8/6 to 15–16/14 threads/cm.	–
Mušov , U Propustě (distr. Břeclav)	2	Lt B2	Textiles twisted in the bronze hollow anklets, z/?, diameter 0.5 mm, flax.	Kostelníková 2002a
Nížkovice , Záhumenice (distr. Vyškov)	4	Lt B	Textiles twisted in the bronze hollow anklet, tabby, z/z, diameter 0.4–0.7/0.4–0.7 mm, 10–13/7–10 threads/cm, flax/hemp?	Belanová 2005a, fig. 12
Postoupky , obec Postoupky-Hradisko (distr. Kroměříž)	unknown grave	Lt	Mineralised textiles on iron scabbard, knife and belt ring, tabby, s/s, diameter 2 mm, 5/4–5/5 threads/cm, wool.	Bender Jørgensen 2005, 141
Sedlec , škola (distr. Břeclav)	unknown grave	Lt	Textile attached to the surface of bronze knobbed anklet, tabby, z/z, diameter 0.65/0.6 mm, 13/13 threads/cm, plant fibre.	–
Slavkov u Brna , Povětrníky (distr. Vyškov)	6, 7, unknown grave	Lt B–Lt C	Mineralised textiles on two iron fibulae and an iron belt ring, tabby, 2/2 twill, z/z, diameter from 0.6–1.2 to 1–1.4/1–1.4 mm, from 4/4 to 14/15 threads/cm, flax?	Bender Jørgensen 2005, 141
Telnice , cihelna Mrkvicova (distr. Brno-venkov)	single grave	Lt	Mineralised textile on iron fibula, tabby, z/z, 14/14 threads/cm.	Bender Jørgensen 2005, 141
Zaječí , štěrkovna, Babeschölzel (distr. Břeclav)	single grave	L B2	Textiles twisted in the bronze hollow anklet, tabby, z/z, diameter 0.4–0.6/0.4–0.6 mm, 16–18/13–14 threads/cm, flax.	Belanová 2007, 44, Fig. 3

Table 15.3. *Assemblage of textile fragments found in La Tène period graves in south Moravia.*

Site	Grave No.	Date	Description	Bibliography
"Bohemia", unknown site	unknown grave	Lt B2	Mineralised textile on an iron scabbard, tabby, z/s, diameter 0.5–0.7/0.5–0.6 mm, 6–8/6 threads/cm.	Sankot and von Kurzynski 1994, 542
Chýně (distr. Praha-západ)	unknown grave	Lt C1	Mineralised textile imprints on the bronze knobbed anklet, tabby.	Sankot and von Kurzynski 1994, 540
Jenišův Újezd (distr. Teplice)	8, 13, 24, 25, 30, 31, 36, 38, 48, 51, 52, 60, 75, 78, 81, 82, 91, 92, 96, 97, 98, 101, 103, 105, 106, 111, 138	Lt B1– Lt C1	Mineralised textiles attached to iron scabbards, belt fittings, fibulae and a shield mounting and to bronze arm rings, anklets and rings; tabby, 2/2 twill, z/z, diameter from 0.75–1–1.5 to 2.25 mm, from 3–4/3 to 8/6 threads/cm, all are woollen.	Kostelníková 1978; Waldhauser 1978
Letky (obec Libčice n/Vltavou (distr. Praha-západ)	1, 9, 10, 30	Lt B1– Lt C1	Mineralised textiles attached to iron scabbards and a shield mounting, tabby, 2/2 twill, z/z, diameter from 0.6–0.7/0.5/0.6 to 1.4/1.4 mm, from 4–6/4–6 to 8/4 threads/cm, wool?	Waldhauser 1987, 89–105; Sankot and von Kurzynski 1994, 540
Lochenice (distr. Hradec Králové)	unknown grave	Lt	Mineralised textile on an iron shield mounting, tabby, z/z, diameter 0.9/0.5–0.8 mm, 6/6 threads/cm, wool?	Sankot and von Kurzynski 1994, 540
Nová Ves u Kralup (distr. Mělník)	unknown grave	Lt C1	Mineralised textile on an iron scabbard, tabby, z/z, diameter 2–3/2–3 mm, 3/4 threads/cm, wool.	Sankot and von Kurzynski 1994, 540
Nymburk, U kostela Sv. Jiří (distr. Nymburk)	unknown grave	Lt B2b	Mineralised textile attached to a bronze ring and iron belt fragment, tabby, z/z?, diameter 1.8–2/2 mm, 4/4 threads/cm, wool.	Sankot and von Kurzynski 1994, 538
Obora u Hořic, obec Chomutice (distr. Jičín)	unknown grave	Lt B2b	Mineralised textile attached to the surface of a bronze knobbed anklet, 2/2 twill, diameter 0.5/0.6 mm.	Sankot and von Kurzynski 1994, 540
Okoř (distr. Praha-západ)	unknown grave	Lt B1b	Mineralised textile attached to an iron belt ring, 2/2 twill, z/z?, diameter 1 mm, 10/? threads/cm.	Sankot and von Kurzynski 1994, 538
Pečky (distr. Nymburk)	3	Lt B2a	Textiles attached to hollow bronze anklets, tabby, z/z, diameter from 0.3–0.4/0.2–0.4 to 0.4–0.6/0.4–0.6 mm, from 14/16 to 14–16/16 threads/cm, flax.	Sankot and von Kurzynski 1994, 540
Praha-Sedlec, Hergettova cihelna (distr. Praha)	unknown grave	Lt B2	Mineralised imprints of a textile on the surface of an iron arm ring, tabby, diameter 0.4/0.5–0.8 mm, 10/12–14 threads/cm.	Sankot and von Kurzynski 1994, 538
Přemýšlení (distr. Praha-východ)	double grave	Lt B2	Mineralised textile wrapped around an iron scabbard, tabby, z/z, diameter 1–1.2/1.2 mm, 4/3 threads/cm, wool.	Sankot and von Kurzynski 1994, 540
Radovesice I., Vápenka (distr. Teplice)	3, 9, 12, 13, 15, 17, 19, 20, 21	Lt B1– Lt B2	Mineralised textiles on some bronze arm rings, anklets, fibula and iron scabbard and arm ring. Not analysed.	Waldhauser 1987, 106–136
Radovesice II., Na vyhlídce (distr. Teplice)	9	Lt B2a	Textile attached to an iron scabbard, twill, animal fibres.	Waldhauser 1999, 94, 164
Soběsuky (distr. Chomutov)	1, 9	Lt B2b– Lt C1a	Textile imprints on the surface of an iron fibula, bronze knobbed anklet and bronze-iron belt chain, tabby.	Holodňák 1988, 53
Staňkovice, Tařka (distr. Louny)	5	Lt B2b– Lt C1a	Textile imprints on the iron-bronze belt chain, twill and textile on the chest of the skeleton, basket weave.	Holodňák 1988, 55
Stehelčevy, V drůbežárně (distr. Kladno)	single grave	Lt B2	Textile twisted inside the bronze hollow anklet, tabby, 10/10 threads/cm, hemp.	Knor 1964, 117, 119, 121, 124; Sankot and von Kurzynski 1994, 542
Stráňce (distr. Most)	2, 11, 12, 13	Lt B1– Lt B2	Textiles attached to two iron scabbards, an iron fibula and bronze unknown objects, tabby, twill, z/z, diameter from 0.9/1.5 to 1–2 mm, 6/? threads/cm, wool, plant fibre.	Kostelníková 1987a; Waldhauser 1987, 137–149
Tišice (distr. Mělník)	9, 17, 2349	Lt B1– Lt C1	String wrapped around the bronze knobbed anklet in grave 9 and textile wrapped around iron scabbard and lancehead in grave 17 – not analysed. In 2349 textiles wrapping the iron scabbard: tabby, z/z, diameter 0.4–0.5/ 0.8 mm, 8/9 threads/cm and shears with razor wrapped in two layers: 1) tabby, S2z, diameter 0.3–0.4 mm, 2) 2/1 twill, S2z/z, diameter 0.5/ 0.4–0.5 mm.	Turek 1997, 239, 247; Waldhauser 1999, 178–179; Březinová 2007b
Tuchomyšl (distr. Ústí nad Labem)	5	Lt B1	Textile wrapped around the iron sword scabbard, tabby, z/z, diameter 1.25–1.5/1 mm, 5/6–7 threads/cm, wool?	Kostelníková 1987b; Waldhauser 1987, 150–162
Veliký Brázdim (distr. Praha-východ)	unknown grave	Lt B2	Textile attached to the surface of the bronze knobbed anklets, tabby, z/z, diameter from 0.4–0.5/0.3–0.4 to 0.5/0.4–0.5 mm, from 5–6/7–8 to 6/7–8 threads/cm, flax.	Sankot and von Kurzynski 1994, 538

Table 15.4. Assemblage of textile fragments found in La Tène period graves in Bohemia.



Fig. 15.7. Selection of loom weights and clay spools together with a ceramic vessel from house 1/02 at Nové Košariská, Hallstatt period (Photo: P. Bugyi, Courtesy of the Archaeological Museum in Bratislava).

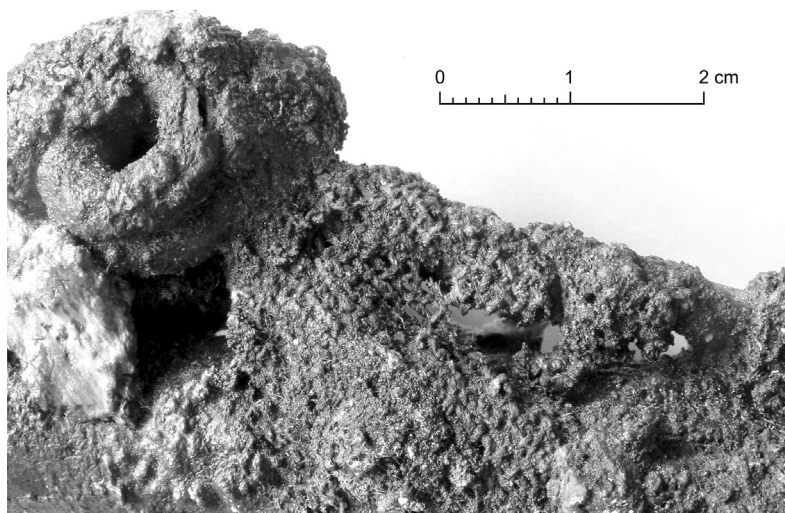


Fig. 15.8. Detail of mineralised fabric covering a corroded iron fibula and a lancehead, grave 11/52 at Veľká Maňa, La Tène period. Presumably, these two artefacts were originally wrapped in a cloth (Photo: T. Belanová-Štolcová).

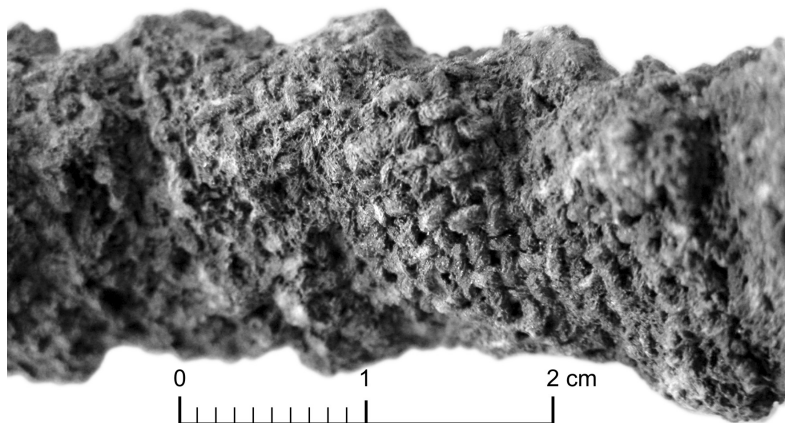


Fig. 15.9. Detail of mineralised fabric covering part of a corroded iron-bronze belt chain, which originally fastened a garment, grave 21 at Holubice, La Tène period (Photo: T. Belanová-Štolcová).

geographical context in Moravia (see Table 15.3), discussed below, or Bohemia (see Table 15.4), e.g. in Jenišův Újezd (Kostelníková 1978; Waldhauser 1978), shows that the occurrence of thicker wool textiles in Celtic graves (Waldhauser 1999, 41) is highly probable.

Mineralised textiles are usually tiny in size. Their qualities differ from very loose and coarse with 4–10 threads/cm in both systems, to very fine and dense fabrics with up to 28 threads/cm, mostly in the warp.³ With only a few exceptions, all finds are of z/z twist. Due to the corrosion processes, the actual thickness of threads is difficult to determine on most of the mineralised fragments, but where identifiable, they have been listed in Table 15.2. Except in the cases of larger pieces of textiles from hollow bronze anklets, no borders, selvages or indications of sewing were found. The range of textile techniques is limited to only woven pieces and some cords, the latter exemplified by S2z-plyed and 0.8 cm thick cord placed in a bronze anklet from grave 113 in Veľká Maňa (Fig. 15.8; Opralová 1984b). No non-woven textiles have been found among the La Tène period material.

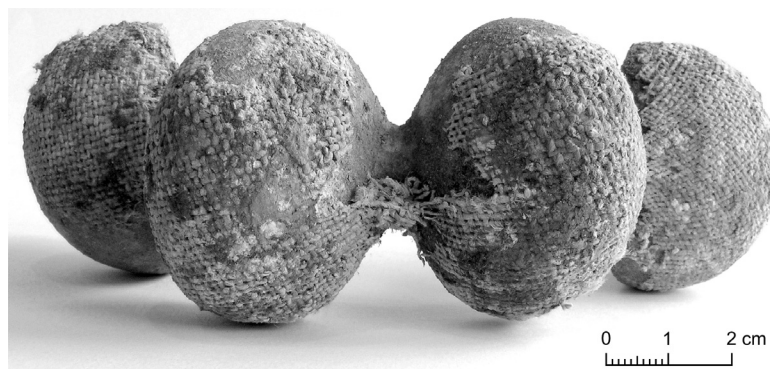
There are various examples of the primary use of textiles within the surveyed area in the rich, male warrior and female graves. They occur mostly on iron knives, razors, shears, lanceheads, shield mountings, scabbards, belts or fibulae, bronze armbands, anklets and other clothing ornaments (see Table 15.2). Textile fragments are generally preserved on the surface of these objects in one to three layers, sometimes even covering two artefacts which have coalesced in the process of mineralisation. The presence of clothing is clearly attested by textiles found on iron brooches, which originally had fastened a piece of garment. Their thread counts vary from 6/6 to 20/20 threads/cm and they are woven exclusively in tabby. Evidence for clothing is also provided by fragmentary pieces of iron belts with fabric usually mineralised on one side; these textiles have the same features as the textiles preserved on brooches. There are also double layers of textiles of different qualities on small iron rings, which were originally parts of these belts. Textiles preserved on iron weapons have different characteristics. They are coarser, and both tabby and 2/2 twill are attested. Their thread counts vary from 4 to 10 threads/cm in both systems. Iron sword scabbards often

appear to have been wrapped in textiles. On an iron scabbard from the warrior grave 28 at Chotín, two types of textiles were found overlapping each other: a 2/2 twill on both sides and a tabby on one side only. Similar remains of wrapping are found on iron implements like knives, razors or shears. The textiles are generally very coarse except for a piece of half-basket weave from cremation grave 7 in Bučany (Bujna and Romsauer 1983, Pls V.17–18; XI.10–12), which has a thread count of 14/22 threads/cm (see Fig. 15.1). A different use of textiles can be considered for the bronze knobbed anklet from the female inhumation grave 1/80 at Hurbanovo-Abadomb. Here, on the outer surface of the anklet, a very fine linen tabby with 0.2–0.5 mm thick thread in both systems and a thread-count of 22/26 threads/cm was preserved (Opralová 1983a; Furmánek and Pieta 1985, 56, 125, Fig. 52). Textiles retrieved from inside the hollow bronze anklets and their major characteristics and function are discussed below together with the Moravian finds.

Moravia

La Tène textiles from Moravia have features similar to the Slovak material. Within the collection, 58 textile samples from 36 graves from 17 La Tène cemeteries were examined (see Table 15.3). As in Slovakia, simple tabby predominates (71%), with 2% basket weaves and only 10% twills. About 17% of all cloth types have remained unidentified. Almost half of the raw material was indeterminable (44%). However, where identification was possible, wool constituted 26%; plant material comprised 30% of all the samples, of which 21% included flax fibre and the rest flax/hemp fibre.

With the exception of larger pieces from anklets, the finds are too fragmentary to determine features such as selvages, borders or stitches. Textiles range from coarser and thicker ones, with a thread count of 4–10 in both systems, to finer fragments with 16–18 threads/cm in warp, the latter deriving solely from inside hollow anklets. The majority of all finds have single yarns with z/z twist. Only 3% of textiles had s/s twist, e.g. a piece of a coarse wool tabby adhering to the iron sword from Postoupky with a thread count of 5/5 threads/cm (Bender Jørgensen 2005, 141). As for plied yarns, there is a piece of textile attached to the



edge of a lancehead from Blučina (grave 16), a 2/2 twill with plied warp (S2z) and single-spun weft (z), and a thread count of 8/8 threads/cm (Bender Jørgensen 2005, 140; Belanová 2005a, 181, Fig. 6).

As in the case of the Slovak finds, textiles have been preserved on various iron and bronze artefacts from the rich inhumation graves. Iron brooches attest to the fastening of clothes of various qualities, with thread counts ranging from 4/4 to 18/15 threads/cm. In some cases, different weaves were present on the object in several layers, as in the case of a tabby covered by a thick 2/2 twill found on a fibula from grave 56 in Holubice (Bender Jørgensen 2005, 141; Belanová 2005a, 181–182). Other personal objects, like arm rings or chains bear textile traces with similar features to those found on the brooches. In contrast, textiles which have mineralised on pieces of iron belts (Fig. 15.9) are coarser, having 7 to 9 threads/cm in both systems. As for the weapons, textiles are preserved mostly on sword scabbards and, similarly to the Slovak material, they are very coarse with thread counts ranging from 5/4 to 9/6 threads/cm. In one case, at Břeclav, there is clear evidence of wrapping the artefact with thick wool (Bender Jørgensen 2005, 141). Most of the textiles attached to iron weapons were determined as wool.

As in the case of the find from Hurbanovo-Abadomb, Slovakia (Furmánek and Pieta 1985, Fig. 52), there are examples of the massive bronze knobbed anklets covered with textiles. These rings are typical female grave goods dated to Lt B2/C1–Lt C1 (Bujna 2005, 148–154, Figs 34–35). From Moravia, such rings were found in Sedlec (unknown grave) and in the double grave 17 at Křenovice (Belanová 2005a, Fig. 7). Well-preserved linen tabby covering almost the entire surfaces of both

Fig. 15.10. Well-preserved linen tabby fabric covering the surface of the bronze knobbed anklet, grave 827 in Hustopeče, La Tène period (Photo: T. Belanová-Štolcová).

knobbed anklets (Fig. 15.10) has recently been found in grave 827 at Hustopeče (Kos 2005; Belanová 2007, 44, Fig. 4). Similar finds can be observed in Bohemia, *e.g.* at Obora or Chýně (Sankot and von Kurzynski 1994, 538–540). All of these textile remains and impressions in bronze patina indicate wrapping around knobbed rings. Furthermore, in a rich female inhumation grave No. 9 at Tišice, there is evidence of a well-preserved bundle of strings made of plant material wound around such anklets, which is supposed to be used for repairing or as a padding to protect the naked ankle (Turek 1997, 239, 247, Figs 9.7–9.9). When we think about the weight and size of these anklets, it is likely that both strings and textiles would be wrapped around them to protect the wearer. On the other hand, the question remains, whether these rings were meant to be worn in daily life or if they were used only in burial contexts.

Bohemia

The La Tène textiles from the territory of Bohemia are currently represented by 84 samples from 65 graves from 21 cemeteries (see Table 15.4). Many of them have not been analysed yet, but they display features similar to the material described above. Tabbies predominate (23%), but twills are also quite common (16%) while basket weave occurred only in one case; 60% of all cloth types remain unidentified. In contrast to the Slovak material, wool has been identified in 18% and plant material constituted only 5%, while the rest (64%) has not yet been analysed.

Textiles are preserved on iron and bronze artefacts as in Slovakia and Moravia. The majority of the material indicates a common use of single z/z-twisted yarn combination (25%), while there is scarce evidence for S2z/z and z/s-twisted yarn. Thus, on iron shears found in Tišice, grave 2349, 2/1 twill with S2z-plyed yarns covered a tabby fabric with S2z-plyed yarns in both systems (Březinová 2007b). Regrettably, in the majority of the Bohemian material, the twist direction is unidentifiable (72%).

Most of the analysed textiles have been preserved on iron scabbards, attesting to the wrapping of these weapons (*e.g.* at Přemysleni, Radovesice I, Tišice or Tuchomyšl). They are very coarse with a thread count ranging from 3 to 9 threads/cm in both systems. Similar

pieces occurred on iron shield mountings. They are woven in tabby or 2/2 twill and when identified, they are mostly made of wool. As for the jewellery and belt fittings, textiles show similar and higher qualities in thread count: about 5–10 threads/cm in one system and up to 12–14 in the other. As in the Slovak and Moravian material, textiles from the tubular bronze anklets are of the finest quality.

Textile Function

Several aspects of the use of textiles can be considered at this point. They could have been parts of clothing, pieces used for ritual wrapping of grave goods, or ‘recycled’ textiles used as fillings in rings. Regrettably, due to their fragmentary state and the lack of information on sewing details, selvages, decoration, and colours, it is very hard to differentiate between textiles, which were used in daily life and those used solely for burial purposes.

The clothing is particularly difficult to identify. However, some differences are found in textile quality depending on the type of object on which they are preserved. Generally, finer fabrics (of up to 24 threads/cm in warp) adhere to jewellery and other personal items. The presence of two or more layers of textiles on fibulae (*e.g.* in Chotín or Holubice) may indicate the use of several garment layers or reveal the way a garment was worn. On the other hand, an iron fibula from the adult female inhumation grave 331 in Malé Kosihy (Bujna 1995, 73, Pl. 36.8) entirely covered in textile, is more likely to have been wrapped in cloth. Textiles are often found on iron chain belts, predominantly only on one side and these textiles are relatively fine (generally with a thread count of 10–23 threads/cm in warp, 8–16 in weft). On the other hand, coarser fabrics usually adhere to weapons found in warrior graves. Textiles preserved on swords and scabbards have only 3–10 threads/cm in warp. These coarse fragments either come from the upper garment of the deceased, or they are parts of ritual wrappings of individual artefacts. The majority of the coarser fabrics are determined as wool which supports the assumption that coarser textiles were usually made of wool whilst finer ones were made of linen (Bender Jørgensen 1992b, 49).

Hollow Bronze Anklets

Of special interest are the textiles that have

been found inside various types of Old and Middle La Tène tubular anklets made of thin bronze sheet. An anklet type with transversely ribbed hoop and moulded decoration of triple protuberances and the so-called caterpillar-shaped type of anklet are of particular importance in this context. They are commonly dated to Lt B1, Lt B2 and Lt B2/Lt C1, *i.e.* from the second quarter of the 4th to the first half of the 3rd century BC (Bujna 2004, 321; 2005, 140–149). These types of anklets always occur in pairs in female inhumation graves, and have been found across the area from Burgenland in Austria to Transdanubia as well as the entire territory of the Carpathian Basin (Bujna 2005, 147). The hollow anklets are usually filled with fine clay or sand, but in some cases there is a firmly twisted piece of textile inside (Figs 15.11–15.12). The textile is usually fully organic and very well preserved. Therefore, these finds are considered to be a very important source of information for the La Tène textiles in this area. In some cases, the anklets are completely filled with textiles, but sometimes they are found only in the closing ends in a form of a plug (*e.g.* grave 116 at Veľká Maňa, graves 43/71, 58/72 at Palárikovo).

On the territory of Slovakia, such anklets have been found in flat inhumation graves. They are known from grave 9 in Nové Zámky, graves 55 and 58 in Svätý Peter, graves 104, 113, 116 and 129 in Veľká Maňa, graves 1, 15, 43, 50, 53, 58 in Palárikovo (see Fig. 15.11), graves 233 and 234 in Trnovec nad Váhom, and grave 11/80 in Hurbanovo-Bacherov Majer (*cf.* Opralová 1984a; 1984b; 1985a; 1985b; 1986; Opralová-Dolejšová 1987).

The same types of anklets with textile fillings have been found in Moravia. The largest pieces come from graves 48 and 67 at Brno-Maloměřice (Belanová 2005b). Smaller and more fragmentary fabrics were retrieved from anklets from Zaječí (see Fig. 15.12; Belanová 2007, 44, Fig. 3), Miroslav, Mušov-‘U Propustě’ (Kostelníková 2002a) and Nížkovice (Belanová 2005a, 178, 182, 184). Textile preserved inside broken hollow rings in grave 6 at Blučina and in grave 53 in Palárikovo are examples of cases when the textile inside can be easily overlooked and conserved by lacquer (see Fig. 15.11). In Bohemia, anklets with textiles were found only in two cases, Pečky and Stehelčevy (Sankot and von Kurzynski 1994, 540–542).

In Nové Zámky, Slovakia, five very fine

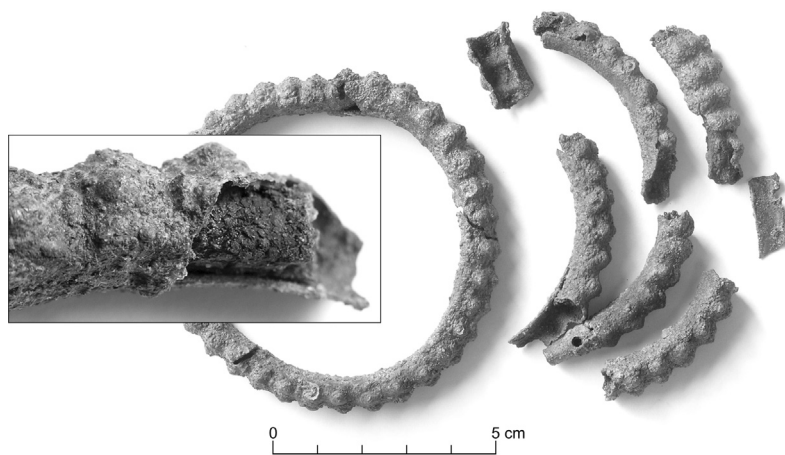


Fig. 15.11. It is not possible to take out some of the textiles twisted in bronze tubular anklets, because they are too mineralised or often conserved; grave 53/71 at Palárikovo, La Tène period (Photo: T. Belanová-Štolcová).

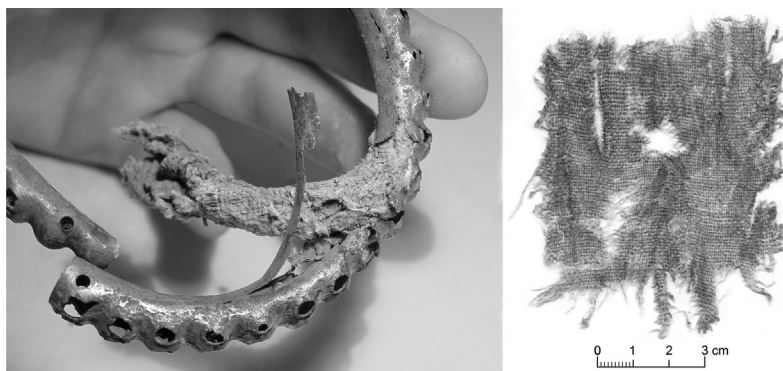


Fig. 15.12. Twisted piece of textile being taken out through corrosion holes in the bronze tubular anklet (left) and the textile fragment after conservation (right), Zaječí, La Tène period (Photo: T. Belanová-Štolcová).



Fig. 15.13. General view of the large weaving workshop No. 58, before the loom weights were destroyed in the heavy rains during excavation in 1974. Cífer-Pác, 4th century AD (Photo: Courtesy of T. Kolník).

linen tabby fragments were twisted inside a pair of bronze anklets (Pieta 1992). Clearly visible stitch-holes in all of these pieces bear witness to previous embroidery, which has been analysed

and reconstructed (Furmánek and Pieta 1985, 52–55; Pieta 1992; Belanová 2005a, 178–181; Belanová *et al.* 2005, 123–131). Similar pieces, although without any traces of embroidery, were found in the largest Moravian Celtic graveyard in Brno-Maloměřice (Čížmářová 2005). These fabrics resemble the fragments from Nové Zámky – very fine and dense, with stitch holes and some selvage (Belanová 2005a, 182; Belanová 2005b). Similarly, four fragments of textiles were recovered from grave 58 at Svätý Peter (Dušek 1960, 459–460). They were z/z twisted linen tabbies, but their varying thread count and thickness indicate that they are unlikely to have belonged to the same fabric (Pieta 1992, 56; Bender Jørgensen 2005, 141). Features such as weaving faults (double thread in weft) or irregular stitch holes and remains of a running stitch were also observed (Opralová 1986). Regrettably, the original colour could not be identified in any of these cases, although according to preliminary analyses of the fabrics from Nové Zámky, the embroidery was considered to have been made with wool thread of a red colour (Pieta 1992, 56).

It has been suggested that textiles served as the filling material in the production process, to help bend the bronze into a circular shape. Hans-Jürgen Hundt (1978) performed several experiments to test this hypothesis, basing it on hollow bronze arm rings dated to the Early La Tène period, which were filled either with clay, textile or wood (twigs). He concluded that these materials were likely to have been placed inside the ring when it was bent into a circle to prevent deformation during wear (Hundt 1978, 622). A similar technique could have been applied to the anklets. Karol Pieta also suggested that fillings of various materials could be connected to the production process (Pieta 1992, 56). In the Bohemian find from Pečky, a linen tabby found in an anklet was wrapped around a clay core. This was probably done to make the clay more flexible and not stick to the bronze during the production process (Sankot and von Kurzynski 1994, 540). Likewise, Kostelníková (2002a, 325) suggested the bronze sheet was rolled around the textile which served as a base for embossing the decoration onto the ring.

All of the above-mentioned theories were recently verified by reproducing Early and Middle La Tène hollow bronze anklets found

at a cemetery in Mannersdorf am Leithagebirge, Lower Austria (Müllauer and Ramsel 2007). Eight pairs of anklets were filled with various combinations of textile, clay, sand or wood. Experiments on technology and microscopic observations prove that firmly twisted textiles served as a form of frame for bending the decorated tube into a ring and consequently as a pad for the final hammering of the small folds of the inner seam of the ring, which is a difficult task in the production process (Müllauer and Ramsel 2007, 80).

It would appear that the frayed pieces of textile were placed inside the hollow rings during the production process, irrespective of their quality. They prove that, apart from clothing or wrapping, every little thread or worn-out textile was used as much as possible beyond its original purpose.

Roman Period

The only finds of textiles from Slovakia and the Czech Republic dated to the Roman period are small fragments adhering to metal objects found in graves and very rare impressions on the ceramic vessels as in Beckov (see Fig. 15.2) and Komořany (Droberjar 2002, 336). In the burial practices of Germanic peoples, it was quite common to wrap the grave goods in textiles. This is attested at the Early Roman cremation cemetery at Třebusice (Bohemia), where lanceheads, knives, shears wrapped in textiles and groups of objects in textile sachets were found (Urbanová 2008b, 64).

Notable for this period are also fine tabby and twill fabrics from the rich princely graves in Slovakia. In Zohor, graves 2–5, fragments of textiles covered the outer surface of luxurious bronze buckets, bowls and pans. Fabrics woven in 2/1 twill and tabby made of flax and wool covered these artefacts (Kraskovská 1959, 128–132; Kolník 1959, 145, 148). In grave 35/60 at Kostolná pri Dunaji, 2/2 twill with an 8/12 thread count and 0.6–0.8 thick threads was found on an iron knife (Furmánek and Pieta 1985, Fig. 81, 102). In Čáčov, a z/s-twisted diamond twill textile was found completely covering a bronze finger ring and in Krakovany-Stráže I, a tabby fabric covered a part of a silver fibula (Ondrouch 1957, 61–62 110–112, Tab. 14, 27:2; also *cf.* Bender Jørgensen 1992a, 109). Although finds from Krakovany-Stráže I and Čáčov were originally determined as Chinese

silks (Ondrouch 1957, 61–62, 110–112, 167), this identification has not been confirmed by later research (cf. Bender Jørgensen 1992a, 109; Pieta 2002, 347). The poor state of preservation of this material does not allow us to determine whether textile finds from the Slovak princely graves are of local production or if they are imports.

From the territory of southern Moravia, a Germanic princely grave in Mušov dated to the 1st and 2nd centuries AD (Peška and Tejral 2002) is of interest. Here, several mineralised textiles attached to bronze and iron objects, such as spurs, a belt mounting and a knife, were found. They are generally tabbies woven with threads of different twist direction in warp and weft, and some bear traces of a fine embroidery (Kostelníková 2002b). In the Early Roman female grave at Velké Přílepy (Bohemia), two iron brooches with mineralised textiles were found at each shoulder of the deceased. One fibula fastened a finer undergarment and the other a coarser mantle over it (Březinová 2000, 221). The evidence of various weaves like tabby and twill, tablet-woven bands, plied yarns, flax fibres and one sample of possible silk fibre is reported to have been found on a bronze vessel from Řepov (Březinová and Poppová Urbanová 2009; Urbanová and Březinová 2010).

While the textile finds dated to the Roman period are rare, we have important evidence of textile production from the Late Roman settlement in Cífer-Pác, Slovakia.

Roman Textrina in Cífer Pác

The Late Roman settlement of Cífer-Pác which includes the location 'Nad Mlynom' is situated in south-western Slovakia, only about 40 km north of the Roman frontier and around 60 km north-east of the Roman army camp in Carnuntum, Lower Austria (cf. Gostenčnik in this volume). Archaeological excavations carried out by Titus Kolník from 1969 through 1980 revealed a spectacular architectural complex from the 4th century AD (Kolník 1972). In a 60 × 70 m area enclosed by a palisade, foundations of the central stone building as well as several earth and timber or pile construction buildings were excavated. The central structure was built following Roman construction techniques: *domicilia cuncta, curatius ritu Romano constructa*, as Roman historian Ammianus Marcellinus explains

(XVII, I, 7; Kolník 1998, 155–158). Outside the palisade fence, smaller stone architectural features, wells, pottery kilns, textile workshops and typical Germanic pit houses (*Grubenhäuser*) were discovered. The site was originally interpreted as a Roman military camp or a multifunctional complex (Kolník 1972, 1975, 1986), but according to the latest analyses it appears to be the residence of a chieftain who closely cooperated with the Roman provincial authorities (Kolník 1998, 158; 1999, 132–135; 2000, 44).

North-east of the main courtyard, two large subterranean houses with a rectangular ground plan were situated. According to a coin of Constantius II (AD 337–361) and a Late Roman bulb-headed fibula (*Zwiebelknopffibel*), the dating of these structures can be set in the middle of the 4th century AD (Kolník 1986, 418). Both houses, Nos 58 and 60, are of unusually large dimensions: the first is 11 × 14 m and the second 9 × 6 m. They are unique not only for their size but also in relation to the principles of construction, which reveal the employment of both Roman and Germanic elements. More importantly, both of these houses bear witness to an extensive textile production, which is attested by the presence of almost 350 loom weights. Based on these discoveries, the houses were named *textrina* during the excavation (Štolcová and Kolník 2010, 469).

In house No. 58, 205 loom weights were recorded on the floor (Fig. 15.13). According to plans from the field report by Titus Kolník in 1974, the loom weights were mostly located along two walls, while some were scattered in the middle. They were made of sun-dried clay and had either a conical or pyramidal shape. It is not possible to reconstruct the specific location of each piece, because they all disintegrated completely after several heavy rains. Nevertheless, based on the excavation plan, at least 11 various groups of loom weights can be detected. Two of them extend by the north-east wall next to each other. One with 31 weights is 3.20 m wide and the other with 30 weights is 2.54 m wide. While the quantity of loom weights preserved is insufficient for such wide looms, it appears that many of them have disintegrated as they were only sun dried. Another loom may have been leaning against two postholes in the south of the house, where 30 loom weights were found in a 2 m wide

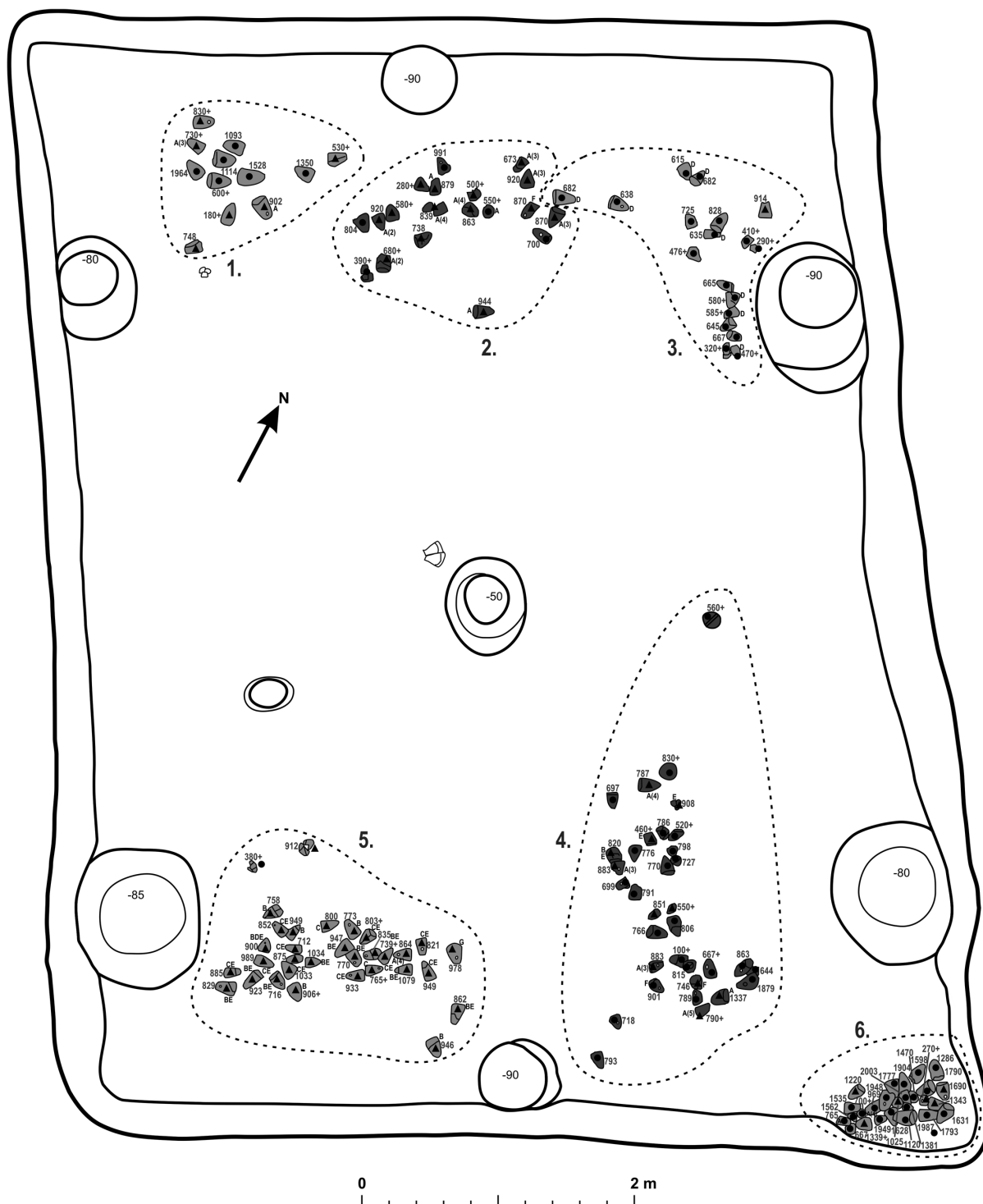


Fig. 15.14. Distribution of loom weights in six different groups according to their shape, weight and marking, house No. 60 at Čifer-Pác, 4th century AD (Redrawn with permission of T. Kolník).

Marks on the loom weights:

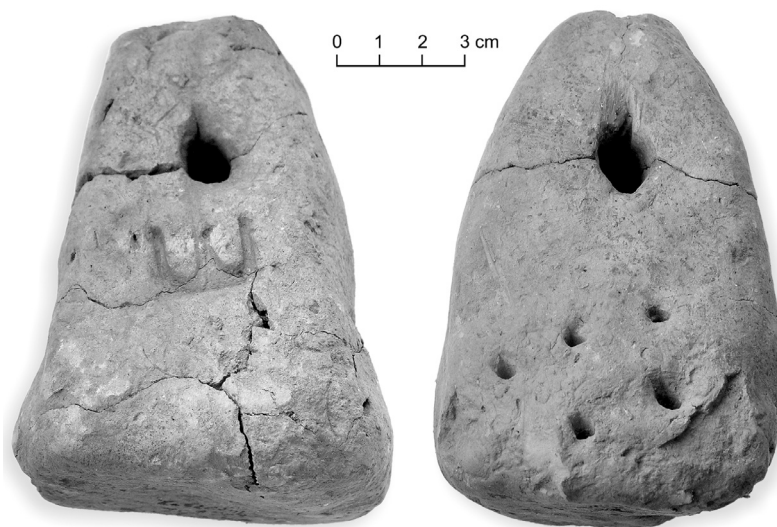
- A key (count, if more than one)
- B cross +
- C cross x
- D fibula
- E punctures
- F pit
- G other / three circles

Shape and weight of the loom weights:

- conical loom weight
- ▲ pyramidal loom weight
- 902 weight of the loom weight (in grams)
- 730+ weight of the loom weight (incomplete)

line. The position of loom weights in lines or groups as sets in storage, as well as lumps of raw material and many small postholes in their surroundings, indicate the presence of warp-weighted looms, as well as the storage of prepared weights and thus a place with extensive textile production.

The neighbouring house No. 60 revealed a similar situation: 142 loom weights of the same material and shape, distributed near two walls in at least six more or less separate groups (Fig. 15.14). However, they bear traces of secondary burning during the fire in the house and thus they have been better preserved. A preliminary spatial analysis could be made according to the size, weight, shape and wear of loom weights. Not all of the loom weights were found in lines, which would indicate that they had fallen from the loom during the destruction of the house. Over 60 pieces from this collection bear different combinations of marks. Apart from the usual marking of a cross on the top, some loom weights have impressions of a Roman fibula or an iron key on the top and various punctures on their sides (Fig. 15.15). Based on the combination of weight, shape and marks, six different groups of loom weights could be detected, of which groups 2, 3, 4 and 5 appear to have originally been standing looms. There is at least one distinctive group (No. 6) of loom weights in the eastern corner of the house, which may have been used as a supply set consisting of very heavy, distinctive, conical weights (with an average weight of c. 1600 g). Group No. 1 includes loom weights with different marks, shape and weight and no spatial arrangement indicating a loom. Group No. 2 bears mostly impressions of keys on the sides and their weight ranges from 800 to 1000 g. Group No. 3 comprises conical weights with an impression of a fibula on the top with more or less the same weight ranging from 615 to 680 g. Group No. 4 includes a mixture of shapes and marks, but its disposition as well as more or less similar weight indicates a loom set. Finally, group No. 5 is noteworthy in that it consists of only pyramidal loom weights with combinations of crosses and punctures, which were found in a 1.80 m long line. Their weight, however, ranges from 770 to 1080 g. Although the weight of loom weights from all six sets has a wide range (from 600 to 2000 g), similarity in shape, weight and marks was observed in these separate groups. The question remains



whether these marks only indicated separate sets of weights for a specific loom or if they also marked special threads during weaving. Another possibility is that marks on the loom weights were a maker's mark (e.g. Rutschmann 1988, 54).

Finally, a smaller group of 29 loom weights scattered in an almost 3 m long line on the floor of a smaller pit house, No. 68, is worth mentioning. The house was situated further to the west from the two above-mentioned workshops, in the north-west part of the site, also outside of the central complex. These loom weights of sun-dried clay had a pyramidal shape, no marks and their weight ranged from 0.6 to 1 kg. The context indicates the existence of a warp-weighted loom, but in comparison with the two large weaving workshops, it was probably used for local household needs.

The majority of the preserved loom weights have wear marks from the threads to which they were tied. Spindle whorls were not so common at the site. There were altogether 67 items, of which nine were found in house No. 58, five in house No. 60, and only one in house No. 68. They were often present in the above-mentioned pit houses together with bronze needles, 33 of which were found. The weight of all the spindle whorls ranges between 5.9 to 39.1 g; the average weight is 21.55 g, with the majority ranging between 15 and 25 g.

Loom weights have not been found in such quantities in the same cultural context dating to the Roman period. However, there is evidence of single warp-weighted looms present in the

Fig. 15.15. Two loom weights bearing marks from house No. 60 in Čífer-Pác, 4th century AD. A T-shaped key is impressed on all four sides of the loom weight (left) and punctures on the side are combined with a cross on the top (right). Both loom weights show wear marks of the threads to which they were tied (Photo: T. Belanová-Štolcová, courtesy of Titus Kolník).

house. Thus, on the territory of Slovakia, 26 loom weights were found *in situ* in settlement II at Liptovská Mara, dated to the 1st century AD (Pieta 1996, 58–60) and 15 loom weights were found at Ostrovany, dated to the Late Roman period (Lamiová-Schmiedlová 2002). From the Czech Republic, there is similar evidence dated to the Early Roman period in Brno-Chrlice with 22 loom weights (Perníčka 1968, 124, 130–131, 136, Fig. 2, Tab. XXIII, XXV.5–6) and Soběsuky with 30 loom weights (Holodňák 1991, 433). In the Early Roman settlement of Ożarów Mazowiecki (Poland), 28–29 conical loom weights were found lying in two rows on the bottom of a semi-subterranean house (Barska 2004; *cf.* Maik in this volume). Apart from loom weights and spindle whorls, other textile tools are rare. However, there is a single find of a four-holed, bone, weaving tablet in house 11 in Křepice (Moravia), dated to the 1st half of the 2nd century AD (Droberjar 1997, Tab. 86.2).

The complex of houses 58 and 60 at Cífer-Pác indicates a well-developed textile production, *i.e.* weaving on several, broad, warp-weighted looms. Late Roman provincial products including luxury products, which were found together with Germanic ones, indicate the presence of a high social class at Cífer-Pác and the existence of a lively exchange of goods. Weaving houses – *textrina* – must have played an important role in the life of this residence. Regrettably, due to the complete lack of textile material, it is difficult to reconstruct the cloth types produced here. John Peter Wild suggested that the warp-weighted loom was particularly suitable for weaving wide fabrics, as opposed to the two-beam loom, which was used for narrow fabrics or tapestry (Wild 1970, 68–71). Loom weights of different size and shape distributed in distinct groups in two large workshops may indicate the production of large fabrics of various qualities.

Migration Period

Textile finds dated to the Migration period on the territory of the Slovak and Czech Republics are rather scarce. They are mostly found mineralised on metal objects in graves. Migration period textiles from five Czech sites have been published: Praha-Podbaba, Praha-Radotín, Radonice nad Ohří, Světec u Bíliny

and Záluží u Čelákovic (Urbanová 2008a). Textiles from these sites have been preserved on knives, bronze rings, a pendant, a pin and iron keys. They are mostly tabbies and twills with z/z, s/s and z/s twist combination and thread counts ranging from 8–10 to 16–17 threads/cm. An interesting find is a very fine 2/2 broken twill with 0.2 mm thick threads, s/z twist direction and 14–17 threads/cm. Regrettably, the raw material could not be determined in any of these finds.

In Slovakia, two gilded silver brooches on the chest of the deceased were found in a female grave dated to the middle of the 5th century AD at Levice, one of which had remains of a thick linen garment woven in tabby (Furmánek and Pieta 1985, 92–93, 103). Similarly, in grave 22 at Klučov in Bohemia, a gilded brooch with remains of a textile has been found. This find, dated to the 6th century AD is a very dense linen tabby with a thread count of 25/16–18 threads/cm and z/z twist combination. In grave 18 from the same graveyard, a similar linen fragment was attached to a silver strainer (Březinová 2003). The recent discovery of a double-chambered chieftain's grave in Poprad-Matejovce (Pieta 2009) tells a different story of preservation in the territory of Slovakia. The first analyses of textiles have already demonstrated the presence of tabby and twill fabrics, as well as some fragments of a tablet-woven band and gold threads, which could be remnants of embroidery (Štolcová *et al.* 2009, 273–275, Figs 10–11). It is hoped that an in-depth study of the textile inventory from this grave will draw a more complete picture of the use of textiles and clothing during the Migration period in the area north of the Middle Danube.

Conclusions

Due to poor preservation conditions, Iron Age textiles from the Slovak and Czech Republics are very fragmentary. Textiles are primarily found in rich burials, most often mineralised on metal grave goods. Wool, flax and also hemp are found in the material. The frequent occurrence of wool finds in the Moravian and Bohemian assemblages can also be the consequence of different soil conditions (Holodňák 1993, 207) in comparison to Slovakia, where mostly linen textiles occur. Fragmentary La Tène textiles and an almost complete lack of textile material

dated to the earlier periods do not allow us to make a comparison across chronological periods in the Slovak and Czech Republics. Nevertheless, the study of the material from this region has shown features similar to other contemporary European material, in particular the broad distribution of linen tabbies in single yarn in the Late Iron Age (La Tène period). The Slovak, Moravian and Bohemian textile finds are comparable to those from the Dürrnberg salt mines, the majority of which is dated to the Late Hallstatt and Early La Tène period, 6th–4th centuries BC (Stöllner 2005, 161, 167; Grömer in this volume).

The range of textile techniques represented by the preserved finds is limited to loom-woven pieces – no tablet-woven textiles or non-woven fabrics have been found with the exception of the recent Migration period find in Poprad-Matejovce. However, the evidence of highly developed long-distance trade in the Hallstatt period allows us to believe that textile types similar to rich collections known from the Austrian salt mines during the Hallstatt and La Tène periods (*cf.* Grömer in this volume), would have existed in this region. As in the most of Europe (Bender Jørgensen 1992a, 121, 125; 1992b, 48–50), there is evidence of the warp-weighted loom and the drop-spindle in the Early Iron Age continuing until the late Roman period.

It is hoped that, in future, textile research in the Czech and Slovak Republics will focus on the search for mineralised textiles from both old and new excavations, as these are often overlooked. Gaining more technical data would enable us to obtain better knowledge of the use of textiles. Furthermore, it is hoped that functional parameters, like the weight of spindle whorls and the weight and thickness of *in situ* finds of loom weights are properly recorded for further reconstructions.

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Notes

- 1 According to the catalogues by Dušek and Dušek (1984; 1995) there are 2151 spindle whorls in the collection of the West Slovakian Museum in Trnava. However, the latest revision resulted in 2243 spindle whorls. As for the loom weights, their number and relevant data have never been published and today they are very fragmentary. According to the original catalogues, there are 198 loom weights.
- 2 These artefacts have been usually interpreted as discoid “idols” with a ritual meaning, because they also occur in the graves (Stegmann-Rajtár 2001, 460). However, many analogies from different sites support the hypothesis that they were used for weaving (*e.g.* Tzachili 2007, 190; Militello 2007; Popović and Vranić 2006).
- 3 With the exception of a few cases, distinguishing the warp from the weft is very difficult in this material. Therefore Bender Jørgensen’s (1986, 288) system of definition has been applied – generally a higher number in thread-count is assigned to the warp and a lower to the weft. Consequently z-spun yarn usually refers to warp.

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SPAIN

Neolithic period	6000–3000 BC
Chalcolithic period	3000–1800 BC
Early Bronze Age	1800–1500 BC
Middle Bronze Age	1500–1300 BC
Late Bronze Age	1300–1100 BC
Iron Age	1100–400 BC
Phoenician/Punic colonies	1000–200 BC
Greek colonies	500–200 BC
Roman period	200 BC–AD 500

SPAIN



Map 16.1. Spain. Sites mentioned in Chapter 16.

Spain

Carmen Alfaro

Introduction

The Iberian Peninsula boasts a wide range of climates. Consequently, the desert and its caves with excellent microclimates, the extremely damp environments provided by sea and lake beds, the interiors of very damp metal mines (the Oiasso/Irun fabrics, for example), and the areas surrounding man-made salt pans are all places where fabrics are found in a relatively good state of preservation. Furthermore, some textiles are preserved through partial carbonisation, when the fabrics have only briefly been in contact with the funerary pyre, as in the case of the textile remains found in the Bronze Age graves from the El Argar and Los Millares cultures (Siret and Siret 1887); Phoenician period textiles from Carmona, Seville (Alfaro and Tébar 2007); Iberian fabrics from tomb 200 in El Cigarralejo, Mula, Murcia (Hundt 1968); nets and fabrics from the Iberian necropolis La Albufereta in Alicante (Alfaro 1984; 2010); and remains of luxurious Roman clothing containing gold thread from Munigua, Mulva in Seville (Alfaro 2005a). Textiles are sometimes preserved through mineralisation by mineral salts contained in groundwater where a metallic

object and fabric were found in contact with each other, as in the case of the linen fabric adhering to a belt buckle from a male burial in the Phoenician necropolis of Angorrilla in Seville (Alfaro 2007). Alternatively, textiles mineralise in contact with metal objects, as in the case of the many examples of Bronze Age halberds (Alfaro 1984, Pls XII, XV– XVII, XIX and XX). Finally, imprints of textiles on ceramics present yet another possibility for studying ancient fabrics (Alfaro 1984, Pls LII–LIII; 1994).

Since the publication of the first catalogue of Spanish prehistoric to Roman textile remains (Alfaro 1984), several interesting new finds have come to light, some of which have been published and others simply been included in excavation reports. The aim of this chapter is to summarise the general characteristics of this material and to provide an overview of textile technology in Spain throughout prehistory and antiquity.

Chronological and Cultural Background

The earliest evidence of textile production in Spain dates back to the Neolithic period, which started in the 6th millennium BC with the

arrival of the first agriculturalists in Andalusia. The Cardial culture of the Mediterranean Neolithic arrived in eastern Spain c. 4700 BC. It is characterised by a particular style of pottery decoration which utilises the shells of a marine mollusc *Cardium edulis*.

The Chalcolithic period in the Iberian Peninsula, which began around 3000 BC, was an extraordinarily rich period, which has yielded much interesting textile material. The Los Millares culture represents the start of copper working on the Iberian Peninsula. Radiocarbon dating places the Los Millares (Almería) settlement in a period between the end of the 4th millennium BC and the last quarter of the 3rd millennium BC. These dates rule out Aegean influence, which until recently was thought to be the basis of culture's development. Los Millares settlements are characterised by large protective walls and rich megalithic tholos tombs located outside the settlement walls, demonstrating that this was a stratified society with a strong dominant elite.

The civilisation of Los Millares was followed in the Bronze Age by the so-called Argaric culture, traditionally dated between 1900 and 1100 BC, although it has recently been found to be earlier than previously thought (2150–1500 BC). It continued into the Middle Bronze Age in a large area of eastern Andalucía and the south-east (Almería, Jaén, areas of Guadix and Baza, the Murcia region and to a lesser extent in Alicante and Albacete). It is characterised by the early use of bronze and sophisticated ceramic techniques. Objects in both materials were traded with other Mediterranean cultures. El Argar, the site after which the culture was named, is located in Almería, and was the first to be excavated (Siret and Siret 1887). Orce (1785 BC), Monachil (1675 BC), Purullena (1670–1185 BC) and many other sites such as Fuente Álamo, Fuente Bermeja, Gatas, El Oficio, Ifré and Almizaraque display the same cultural characteristics. The settlements tend to be situated on elevated sites and were walled, with the different settlements visible to each other, and organised around a larger, more important settlement in each area. The settlements were equipped with water cisterns and surrounded by good farmland. Mining was the other major source of economic growth. In Herrerías, silver occurs naturally, making it easily extractable.

The dead were buried individually in cists made of slabs of stone in the Early Bronze Age, and in large ceramic jars (*pithoi*) from the Middle Bronze Age onwards, in the village itself, either underneath the houses or in more prominent places. With the beginning of the Late Bronze Age around 1300 BC, El Argar disappeared leaving small, post-Argaric, fortified settlements. The Urnfield Culture appeared only in the north-east (Aragón and Catalonia).

The Iron Age spanned from 800 BC to approximately the start of the Roman conquest of Hispania in 218 BC. This is the final prehistoric period which, in the Iberian Peninsula, coincided with the colonisation of the Mediterranean peoples (Phoenicians, Greeks and Carthaginians) and northern European peoples (Celts). The Iron Age in Spain can be defined in terms of Hallstatt-related urn fields in the north-east and the Phoenician colonies in the south. Tartessian-Orientalising represents the symbiosis between the local culture, based on the Orientalising Late Bronze Age tradition in the south and south-eastern Iberian Peninsula, and Phoenician influences. The main problem when studying it is the lack of written sources and the fact that the concepts put forward by the historiography of the previous century are being reviewed only at a slow pace. Funerary contexts represent one of the most informative sources for us. The use of inhumation burials, which coexisted alongside cremation (poorer and with clearly Phoenician roots), enables us to surmise that there were sumptuous rituals in which the textiles have not left the traces that we would hope to find.

The only Greek colony in Spain, Emporion (Ampurias), was founded by the Phocaean Greeks from Massalia in around 575 BC. The importance of textile production in both Ampurias with the surrounding region and its Iberian urban centres, such as Ullastret, is attested by the presence of loom weights and spindle whorls, although there are no specific studies of this subject. The sources also mention another Greek colony in Rosas, although no corroborating archaeological evidence has come to light to date, as is also the case with the Hemeroskopeion (Denia) and Akra Leuké (Alicante) settlements. Modern-day researchers have rejected the standard layout of Greek settlements in a foreign cultural and

Fig. 16.1. (opposite page top) Ropes of lime bast, La Draga, Neolithic period (Photo: © C. Alfaro).

Fig. 16.2. (opposite page centre) Bottom of a basket made of a local water plant (*càrex*), La Draga, Neolithic period (Photo: © C. Alfaro).

Fig. 16.3. (opposite page bottom) SEM image of hemp textile, Los Millares, Chalcolithic period (Photo: © C. Alfaro).

political setting in favour of the concept of intercultural contact. The Greeks are thought to have given names in their language to those indigenous settlements where they worked. There is little doubt that important elements of Iberian culture, which was established in the eastern Iberian Peninsula, were influenced by the Greeks, *e.g.* in terms of writing and painted ceramics. There was also an intensive trade relationship between the Greeks and the mythical Tartessos, in the Guadalquivir Valley, from the end of the 7th century BC to the first half of the 6th century BC. Apart from that, the Iberian Peninsula's past was connected with Greek mythical imagery through tales such as the Labours of Hercules and the arrival of the Achaeans following the destruction of Troy.

The Iberian culture was one of the principal cultures of Spanish protohistory. Early 20th-century historiography linked it with the invasion of peoples from northern Africa, but it is now considered to be an indigenous phenomenon, albeit with marked external influences. Relatively few documents written in the Iberian language have been preserved and the attention of the classical authors has been at best perfunctory. Thus, the bulk of available information on the Iberians has come from archaeological records. It has been established that the Iberian culture emerged in Upper Andalucía, south-east of the plateau and the east coast towards the 6th century BC. The Iberian culture experienced its apogee between the 5th and 3rd centuries BC when full urban development was achieved. The Tartessians, Phoenician and Greek traders and colonists had an impact on the indigenous population. Politically, it appears that they were organised in city states. The impact of the Second Punic War and subsequent Romanisation drastically hindered its historical and cultural development.

The central area of the Iberian Peninsula was home to the Celtiberian Culture, which had Celtic roots, albeit with some specific features. Its origins date back to the beginning of 6th century BC and it primarily flourished between the mid-5th and late 3rd centuries BC. Its main cultural characteristics include Iberian influence in its manufacturing, minting and the use of money and in its socio-political system. The Celtiberians spoke a language belonging to the most ancient branch of the Celtic family

the Celtiberian, although its writing was based on the Iberian system. The archaeological remains are represented by hillfort settlements and cremation necropoleis. Its main towns were Numantia, Termantia and Segóbriga. The Celtiberians' main economic activities were farming and animal husbandry.

The Castro Culture (8th century BC–1st century AD) was an Iron Age culture that developed in the north-western part of the Iberian Peninsula (present-day Galicia, Asturias and Northern Portugal). It is named after its typical form of settlement, the hill fort (*castros* in Spanish). Their origins and development have been traditionally linked to Celtic invasions. However, current theories revolve around internal development drawing on Atlantic Bronze Age cultures. Hand-made ceramics decorated with concentric circles were typical for the Castro Culture. The houses were circular and were initially built of wood and subsequently of stone. In epigraphs, the individuals belonging to this cultural group identified themselves with patronyms, the sign of their *civitas* and *castellum* or hill fort.

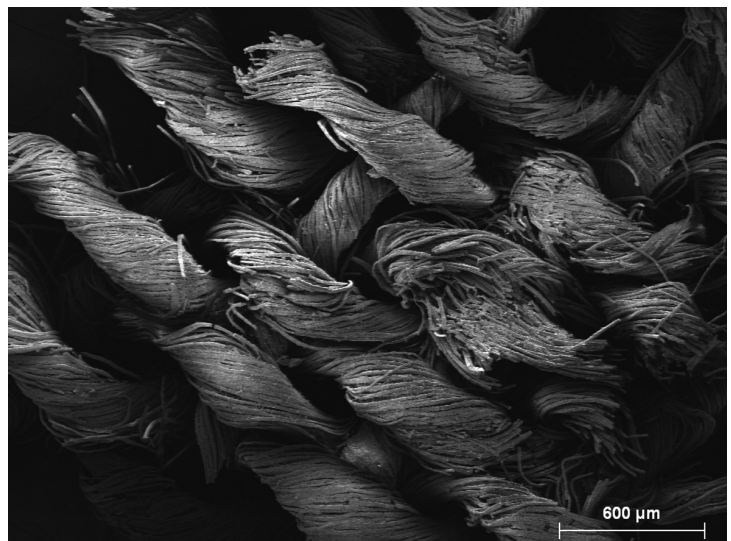
The Lusitanians were the pre-Roman people established in the western Iberian Peninsula. The many references to them in classical sources repeatedly mention their resistance to the Roman conquest, highlighting the audacious actions of their leaders Púnico, Casairos and Viriato between 155–136 BC. These military leaders ran campaigns along the valleys of the Guadiana and Guadalquivir Rivers. However, the Romans put an end to their resistance following the death of Viriato and the dispatching of Junius Brutus to Gallaecia. The reforms of Augustus led to the creation of the province of Lusitania, which permanently linked the region with the area stretching from the Tajo to the Duero. The inhabitants of Lusitania were involved in the Roman army as auxiliaries under Roman rule, demonstrating a rapid Romanisation process. Its capital, Emerita Augusta (Mérida), became one of the most important Roman cities on the Iberian Peninsula.

The Romanisation of the Iberian Peninsula was a complex process differing in terms of chronology and intensity in the various regions. Classical sources describe these territories as a sort of El Dorado of the period. Raw materials, especially from the mining industry, and the wealth of products such as wine, oil,

linen, wool, seafood and other goods attracted many Latins who established themselves in the area. First contact was made at the time of the Second Punic War, specifically in the year 218 BC, when, at Sagunto, the Romans confronted the Punic troops, who were attempting to reach Italy via the north following the Spanish coastline. The most Romanised provinces were those that became the most desirable areas for the new settlements, which developed in the form of colonies, towns and *conventi*. Hispania Baetica became a Senatorial province and Hispania Tarraconensis, which neighboured it and included the entire Mediterranean coast up to the Pyrenees, quickly absorbed the Roman way of life. The process of Romanisation was slower inland. However, archaeological excavations reveal that areas which previously did not seem to have any traces of the Romans, such as the Basque Country and other northern territories, were extensively colonised and that mining activity and the development of cities and smaller towns were indeed a reality. In places with a very strong local culture, such as the Castro Culture in north-eastern Portugal, contact with the Roman culture produced noteworthy technological, lifestyle and artistic results. Emerita Augusta (Mérida) in Lusitania, Corduba in Hispania Baetica and Tarraco in Hispania Tarraconensis were the most important urban centres.

Research History

Besides the numerous articles on archaeological textiles and the synthesising work of the present author (Alfaro 1984), scholarship on ancient textiles in Spain generally consists of publications of textile tools. Examples include the work of J. Maluquer de Motes (1954–58) on the Cortes de Navarra Hallstatt settlement, E. Llobregat on the Bastida de les Alcuses de Moixent (1972), G. Fatás (1967) on the Museo de Zaragoza loom weights and M. Martín Bueno (1968) on the weights from Bílbilis (Calatayud). Machado *et al.* (2001) published the wooden spindles found at the Late Bronze Age site of Terlinques. Other information regarding spindle whorls and loom weights has been published in many reports on old and new excavations, although these objects have rarely been studied with an intention to reconstruct technical and organisational aspects of textile production. Joan Ferrer



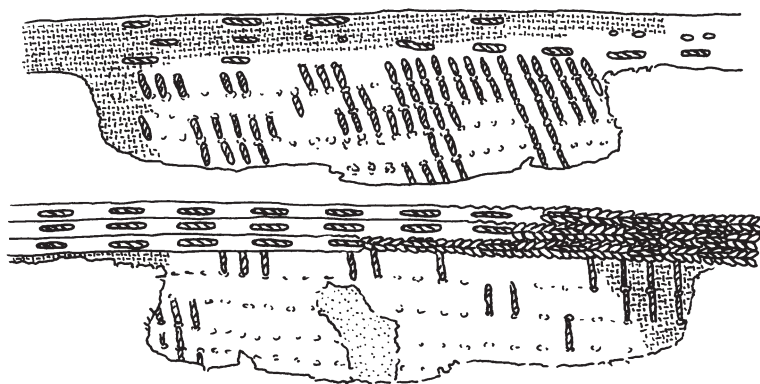


Fig. 16.4. Reinforced linen textile, Cueva Sagrada, Lorca, Chalcolithic period (Drawing: © C. Alfaro).



Fig. 16.5. (above) SEM image of flax fibres, Cuevas de la Garrobina, Bronze Age (Photo: © C. Alfaro).

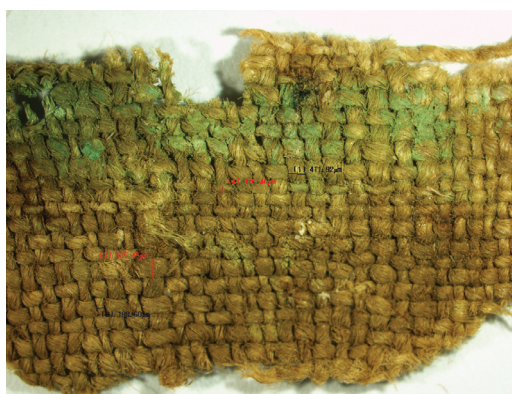


Fig. 16.6. (right) Linen textile, Cuevas de la Garrobina, Bronze Age (Photo: © C. Alfaro).

(2008) has been working on Iberic inscriptions on textile tools from Aragón. General works on textile and clothing have been published by B. Costa (2008).

Neolithic Period

Some of the earliest textile-related material in Spain consists of tools. The oldest conserved spindles do not have spindle whorls and were found at the La Draga lake site (Banyotes, Girona). La Draga is a Cardial culture site, which dates back to the second half of the 6th millennium BC (Bosch *et al.* 2006). There are also some other objects which may be connected to spinning. These are spindle-shaped objects with sharply pointed ends (one end is usually finer than the other), made of hardwoods such as holm oak (*Quercus ilex* L.), hazelnut (*Corylus máxima* L.) or boxwood (*Buxus sempervivens* L.). The length of the conserved artefacts ranges from 15 to 25 cm. Time and the burial environment may have accentuated their slightly curved shape. In some cases, a small lengthways incision is present in the thicker end, which may have been used to fix the end of the wound up thread. The presence of small boxwood (*Buxus sempervivens* L.) combs and what appear to be weaving knives (Bosch *et al.* 2006, 93, fig. 87; 73, fig. 69), may indicate that there was a rudimentary form of textile production in the village. To date the site has not yielded any remains of textiles or fishing nets which one would expect to find in this kind of environment.

However, different types of baskets, very fine ropes, lime/linden fibre cords and, almost as importantly, an S2z-ply thread measuring 0.3–0.4 cm in diameter and 8–10 cm in length and made of fine lime/linden bast fibre have been preserved (Fig. 16.1; Bosch *et al.* 2006, 125, Figs 131–132). The really outstanding artefacts found in La Draga are the basketry remains (Fig. 16.2). The materials used to make these baskets are reeds, a local water plant (*càrex*), fine hazelnut tree branches and willow bark. The ropes and cords were produced using a spindle.

Chalcolithic Period

The fabrics from the Chalcolithic period come from the burials of the Los Millares culture and were preserved due to the carbonisation process that occurred during the cremation of human remains. They are generally woven in fine linen/ hemp and are well-balanced tabbies. In one case (Fig. 16.3), the hemp threads are s-twisted in both systems and have a diameter

of 0.2–0.4 mm and a thread count of 11–12 threads/cm.

Important Chalcolithic textile finds were discovered in a grave at Cueva Sagrada in Lorca (Murcia), radiocarbon-dated to 2200 BC (Ayala 1987; Alfaro 1992; 2005b). Two large, carefully folded pieces of fabric, only parts of which are preserved, were among the rich set of grave goods found alongside various skeletons. The textiles included two rectangular-shaped tunics with lower borders finished in long fringes (tunics A and B), a short cape with a V-necked front (60 × 20 cm) and some relatively large fragments of unknown function (Alfaro 2005b, 234). The fact that a female and child's skeleton were found on top of the tunics suggests that they could be items of clothing. Some of them contain complex reinforcement systems in the areas that must have been under most strain (Fig. 16.4). The textiles are very fine, balanced tabbies (yarn 0.1–0.2 mm thick, 21/28 threads/cm). The threads used for the reinforcement are S2z-plied and measure 0.4 mm in diameter.

With the tunics and skeletons was a set of jewellery, weapons (arrowheads) and a remarkable group of wooden objects, including a boxwood spindle. The spindle has a series of four evenly spaced, circular cracks along its shaft, which were probably used to maintain the wound-up spun thread in place. The thicker end of the spindle has a lengthways incision to fix the thread.

Loom weights dated to the end of the 3rd millennium BC have been found at the La Salud settlement (Lorca in Murcia), very close to the Cueva Sagrada (Ayala 1987; Alfaro 1992; Nielsen 1999, 45, 140–142). They are all of a similar size but come in different shapes: conical, heart-shaped and with two well-separated holes. The heart-shaped loom weights may have been hanging perpendicularly to the crossbeam of the loom (their smaller thickness makes them easier to handle when weaving). Some show signs of having been excessively burnt when they were fired. All are made from local clay and their weight ranges from 350 to 500 g.

Bronze Age

The latest Argaric site, the Cuevas de la Garrobina (Almería), yielded a series of textile fragments that were preserved in contact with



iron bracelets and other metal objects. All of the preserved textiles are made of linen (Fig. 16.5). Some contain single threads and others have plied threads which are only slightly twisted. A small piece of tabby recovered from tomb 6 demonstrates the regular effect of the Bronze Age textiles (Fig. 16.6). The threads are single and z-twisted, with what appears to be the weft being more loosely twisted and slightly coarser. The thread diameter ranges from 0.2 to 0.4 mm.

Among the many artefacts found sporadically and in a few excavations carried out in the area of Mazarrón (Murcia), there are two textile fragments that are representative of the textile techniques used in this territory, which is very rich in Bronze Age textile remains. The area's dry climate has assured the preservation of fibres and textiles. Both fragments are made of linen. The first (Fig. 16.7), although worn

Fig. 16.7. (top) Textile fragment, Mazarrón (detail), Bronze Age (Photo: © V. Bataller).

Fig. 16.8. (bottom) Textile fragment, Mazarrón, Bronze Age (Photo: © V. Bataller).

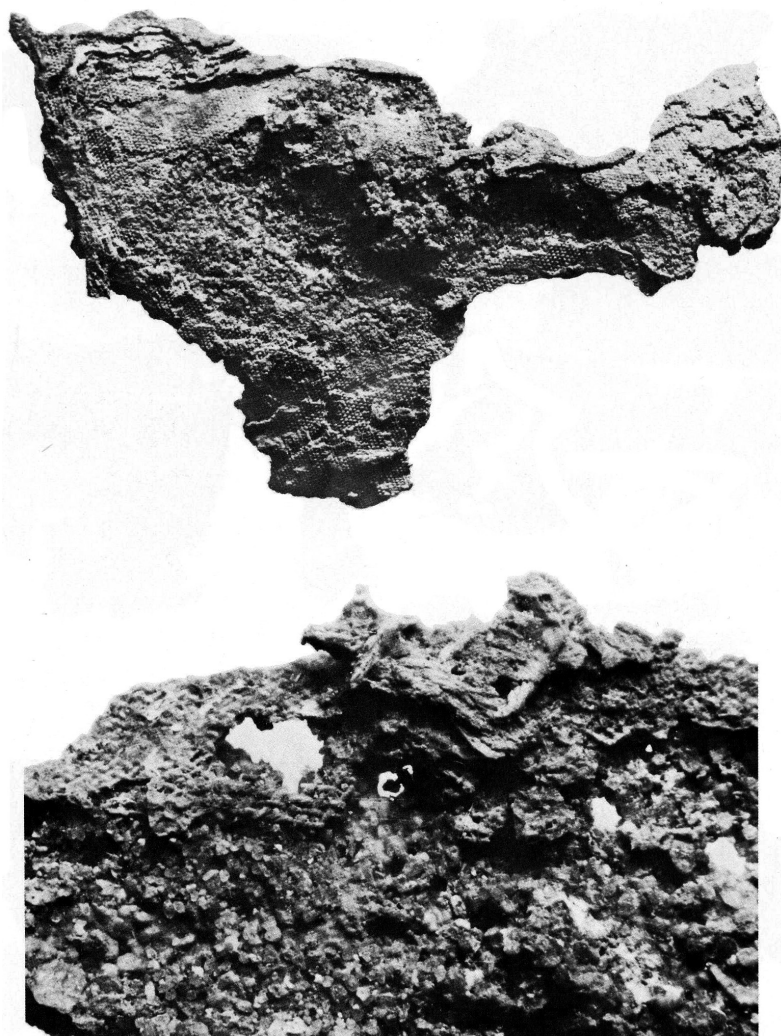


Fig. 16.9. Textiles of different qualities from a Cádiz sarcophagus, Phoenician period (Photo: © C. Alfaro).

and stained, is made in a regular half-basket weave. The single threads, which are possibly the textile's warp, are Z2s-ply. The single loosely z-twisted threads are probably the weft. The second fragment (Fig. 16.8) is a compact tabby made of s-twisted yarn in one direction (0.5 mm and 13 threads/cm) and z-twisted in the other (0.5–0.6 mm and 12 threads/cm).

The Argaric culture sites generally yield spherical loom weights with two holes. Their diameter ranges from 10 to 13 cm. A group of them was found around a large burnt tree trunk and must have been burnt by the fire (Alfaro 1984, 102–103). Their presence in a significant number of dwellings in different settlements



Fig. 16.10. Textile mineralised on a belt buckle, Las Angorrillas, Alcalá del Río near Carmona, Phoenician period (Photo: © C. Alfaro).

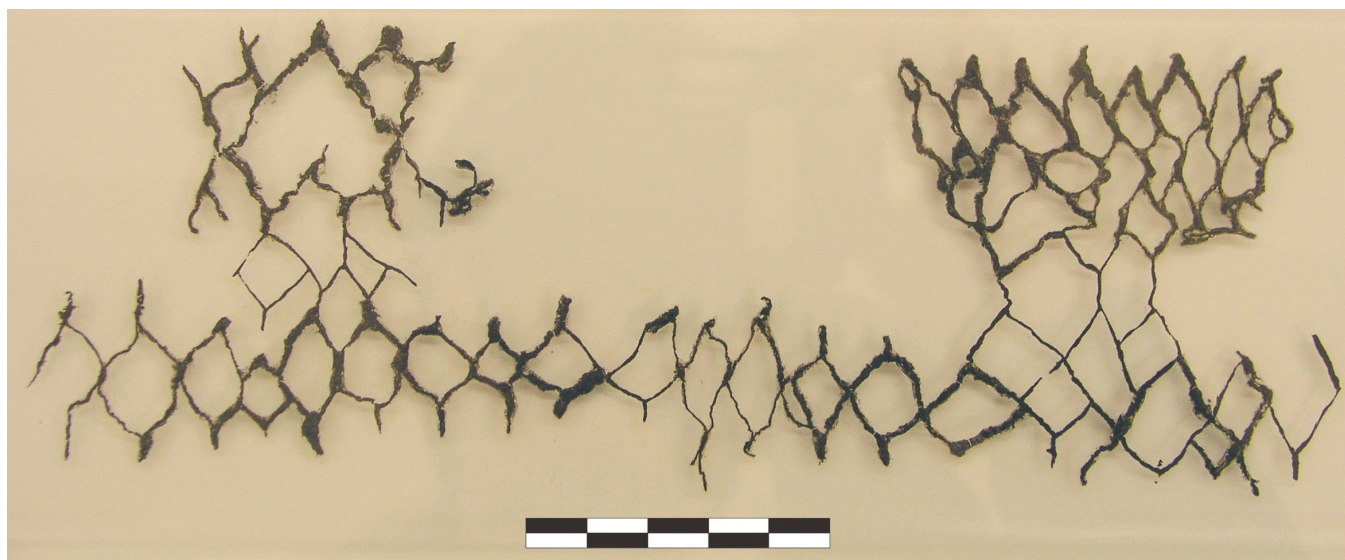


Fig. 16.11. Net from La Albufereta (Alicante), 4th century BC (Photo: © C. Alfaro).

indicates that weaving was primarily a domestic task rather than a form of production organised by the elites (Brunfield 1996).

Iron Age

Besides the local Iberian cultures, during the Iron Age the coast of Iberia was visited regularly by the Greeks and Phoenicians.

Greek Culture

There are no textile remains from Greek archaeological sites, but organic remains have appeared recently in the Greek shipwreck of Cala San Vicenç (Pollensa, Majorca) dated c. 520 BC. The recovery and preservation procedures used have been successful in enabling the shape of the artefacts to be maintained and thereby providing the opportunity for studying them. Half of the wicker lining of a helmet was very well preserved. It was constructed with very fine wicker, which was then covered by fabric or felt. A series of fishing creels and baskets were found piled on top of each other, as were a series of sets of iron picks tied together with esparto grass cords. One of these iron picks had pierced the inside of the helmet, precipitating the mineralisation of the fibres. The boat's strakes were also sewn with very fine esparto grass strings that are barely 2 mm thick (Alfaro 2008 and 2011).

Phoenician/Punic Cultures

Some highly remarkable textile remains from the Phoenician period were found in a female anthropomorphic sarcophagus in Cadiz (Alfaro 1983; 1984, 77–81), which yielded approximately 75 small textile fragments of several qualities. All textiles are made of linen and are woven in tabby (Alfaro 1984, 137–138). Their state of conservation is very poor and some are completely mineralised. The largest fragment measures 8 × 5 cm. The finest fabrics have a 0.1 mm thick, hard s-twisted warp and a 0.3 mm thick, loosely s-twisted weft, with 32/26 threads/cm. The medium quality fabrics are woven in 0.2–0.3 mm thick s-twisted yarn. The coarsest fabrics have the most open weaves (Fig. 16.9) and are woven with Z2s-ply 0.5–0.7 mm thick yarn, with 6/12 threads/cm. The different fabric types probably belong to different garments.

Also among the textiles linked to the Phoenician and Punic presence on the south

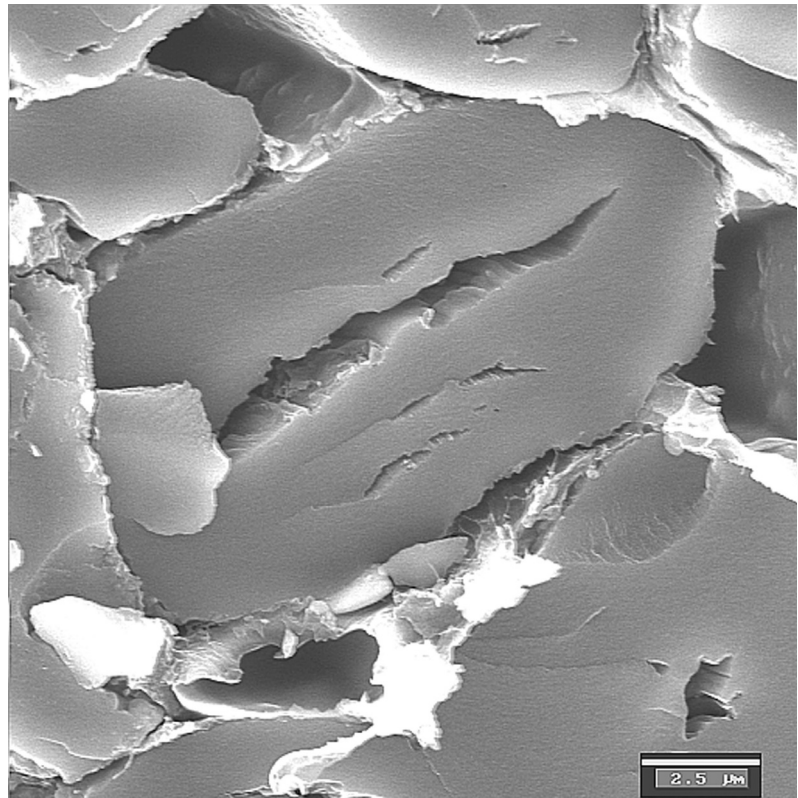


Fig. 16.12. SEM image of hemp fibres from La Albufereta net, 4th century BC (Photo: © C. Alfaro).

and east coasts of the Iberian Peninsula are the carbonised remains from Mairena del Alcor (Seville), which are kept in the Archaeological Museum of Seville, the Bonsor Collection (Alfaro 1984, 144–147) and the Hispanic Society of New York (Alfaro and Tébar 2007). There is also a belt buckle with mineralised remains of a balanced tabby (Fig. 16.10) from the Orientalising necropolis of Las Angorrillas, in Alcalá del Río, near Carmona (Alfaro 2007). Its yarn diameter measures 0.2–0.3 mm in one direction, and 0.3–0.4 mm in the other. The threads are quite strongly s-twisted, with 14 threads/cm in both systems.

Iberian Cultures

Iberian fabrics have normally been preserved in cremations on metal objects such as weapons, belt buckles and brooches. Examples include the fabrics found in tomb 200 at El Cigarralejo, Mula, Murcia, dated to the 4th century BC (Hundt 1968, 187–205; Alfaro 1984, 119–121 and 138–141). Despite their small size and fire damage, these textiles (doubtlessly from the deceased's clothing) are of interest due to their quality and number, and furthermore, because they have two tablet-woven borders. The burial



Fig. 16.13. Cord of a baling pump, Centro de Arqueología Subacuática de Castellón, Roman period (Photo: © C. Alfaro).

also contained a tablet, made of boxwood (*Buxus sempervivens* L.) and measuring 3×3 cm, which may have been used to produce the above-mentioned borders. A total of 50 textile fragments have been preserved. All of the artefacts are made of fine tabby fabric with a yarn diameter measuring 0.1–0.3 mm. The yarn is always single and predominantly z-twisted, apart from 13 fragments that have z-twisted threads. The largest of the tablet weaves is clearly the border of a tabby fabric. The 33 original warp cords have survived and alternate between being S and Z twisted in groups of three (Alfaro 1984, Pl. IX); each cord is made up of four single threads which are 0.2–0.3 mm thick. The other strip or edge is slightly thicker (single 0.4 mm thick threads). The surviving remains of tabby fabric are thought to be related to each of these strips. The thread count varies significantly: 12/12, 22/13, 22/20, 24/20, 32/18–22, 36/22, 30/30, 30/25, 40/32, 46/26 threads/cm. Ten other fragments with very similar features were found in a different burial on the same site.

Among the Iberian period textile fragments that have been preserved in Spain, the group found in La Albufereta necropolis in Alicante is of interest (Alfaro 1984, Pls XXVI and XXVII). They are tabbies in single z-twisted yarn (0.35–0.3 mm thick), just like El Cigarralejo textiles and many other finds from the same period. The thread counts vary: 30/22, 20/12–14, 18/14, 18/18 threads/cm.

Furthermore, four fishing nets were found on the same site (Alfaro 1984; 2010). They belong to different periods. One of them was found in a tomb of the Iberian necropolis and can be dated to the 4th century BC (Fig. 16.11; Alfaro 1984, 150, Pls XXXV and XXXVI, 4). The raw material is hemp (Fig. 16.12) and it is made of simple z-twisted yarn, 0.2 mm thick and Z2s-plied yarn, 0.4 mm thick. The sides of the mesh holes are about 1 cm long, although there are considerable differences between them, ranging from 0.7 to 1.2 cm.

Together with these fragments there were remains of double S2z-plied yarns that still had some knots in them. They were most likely part of a somewhat larger net. In this case the double yarn is 1 mm thick. Not enough has survived to discern the exact mesh size, but the sides of the open spaces were more than 2 cm long. Remains of a slightly thicker (2 mm) Z-plied yarn made from three probably z-twisted yarns could be related to an additional cord from the first net (Alfaro 1984, 150, Pls XXXV–XXXVI).

The third net from La Albufereta was found some years ago in a Roman shipwreck of the Flavian period near this fishing settlement by Asunción Fernández and Carlos De Juan. To date it has been impossible to determine the raw material, although it is probably hemp or flax. While more of the net was intact at the time of its discovery, all that remains today are various undone knots. The netting was made following the so-called cow hitch system. The yarn is S2z-plied. The simple yarn is 2 mm thick and the plied yarn 2–3 mm thick. The distance between knots is 1.2 cm. In addition to the net, a large number of ropes of different thicknesses, remains of baskets and a bailing pump that still had part of the cord used for operating it were recovered (Fig. 16.13).

The study of these textiles as well as some iconographic material such as sculptures enable the reconstruction of complete costumes thereby giving a visual idea of what Iberian garments looked like. For example, the sculpture known as the Lady of Baza, dated to the 4th century BC, was used as a prototype for reconstructing female costume. The sculpture provided information on the colours and textures of the various fabrics, while archaeological textiles furnished the data on the types of yarn and weave (Demant 2008; 2011).

Roman Period

Some of the Roman textile remains that have been preserved in the Iberian Peninsula include gold threads of varying fineness in their wefts (Alfaro 1984, 77–81; 2001, 77–83; 2005a, 1–4). One of the more spectacular finds comes from the Roman burial of the Augustan period (at the turn of the Common Era), found in Cádiz in a rescue excavation (Alfaro 2001). Five young women's graves were found inside a simple, rectangular (2.37 m long), apparently neglected, funeral monument which was aligned with four other very similar monuments. Precious objects and remains of textiles with gold threads had been placed in two of them (Tomb 25 and Tomb 25b). Although the very fine gold thread fragments are very small, their technical quality approaches the peak of technical excellence in ancient wire drawing. The results of the analysis demonstrated that the gold used was virtually pure (97.41%), with a small quantity of silver (1.88%) and a much smaller amount of copper (0.71%). The analysis of gold thread finds from the contemporaneous tomb at Munigua (Mulva, Seville), shows that they have a slightly different composition: 96.34% gold, 3.22% silver and 0.45% of copper, 23 carat gold (Alfaro 2005a).

The threads from the Cádiz burials were made of narrow gold strips, 0.2 mm wide and 3.6 µm thick, z-twisted around a z-twisted fibre core. The core could have been made from silk, linen, or even very finely spun wool, although none survived in this case to make a positive identification (Wild 1970, 132). The final result is a thread with a diameter of 0.1 mm, barely visible to the human eye. The gold thread was used to create a decorative pattern consisting of a band with clover leaves and other floral elements that intertwine to form an extremely delicate and intricate motif, which may have been produced in Alexandria or some eastern workshop (Fig. 16.14). This type of pattern with gold or silver elements has been found in burials throughout the Mediterranean, as for example at Thessaloniki in Greece (*cf.* Spantidaki and Moulherat in this volume) or at Naintré in France (Bédard *et al.* 2005), although these are from a later period than the Cádiz find.

In addition to the splendid gold-thread textiles, a series of small wool textile fragments



were found in 2008, woven in fine 2/2 twill. The fragments are from a Roman mining context (Arditurri) in the outskirts of Irun, Roman Oiasso (Fig. 16.15). The ceramics found in the gallery in which the first artefacts were discovered indicate that this sector of the mine was active c. AD 50–150. Two fragments of wool fabric joined together by stitching, indicating that the fabric was reused (Fig. 16.16), were also found inside another of the mine's galleries in 2009, as were smaller remains connected to them. The Arditurri textiles were preserved in an anaerobic environment due to water saturation caused by infiltration from the river that runs close to the mining galleries. The sheep wool used is "fine-medium" (Alfaro 1984, 19–39; Ryder 2007). The ends of the fibres appear to be highly tapered when their entire length is observed, just as they would have been in the sheep's fleece (Sylvia Mitchke, pers. comm.). This indicates wool from a sheep that had not yet been sheared (less than a year old) or fibre from an adult animal whose fleece had been combed or plucked, instead of being sheared (Alfaro 1978).

Six fabric fragments of varying sizes but with identical characteristics were found during the first excavation: four fragments with relatively worn structures (9 × 7, 8 × 3, 9 × 2 and 5 × 5 cm) and two more compact fragments (8 × 6 cm). It is highly likely that they are from

Fig. 16.14. Flower-shaped element in gold thread, Escalzos, Cádiz, Roman period (Photo: © C. Alfaro).



Fig. 16.15. Wool textile from ancient Oiasso (Irún), Roman period (Photo: © C. Alfaro).



Fig. 16.16. Wool textile from Oiasso (Irún), Roman period (Photo: © C. Alfaro).

the same fabric. Single z-twisted warp and s-twisted weft threads make up the fabric. The combination of twist is common in wool twill textiles both from the Roman period and from the preceding periods (*e.g.* Hallstatt, *cf.* Grömer 2005 and in this volume). The thread diameter is 0.4–0.45 mm, with 8–9 threads/cm in the warp and weft. The threads in both systems are thick and made of very fine and delicate fibres with a relatively high number of hairs, which is the ideal combination for ensuring a warm piece of clothing. Dye tests have proved negative.

The wool textile fragments discovered in 2009 are from a different gallery that belongs to the same Roman mining site. The largest of these measures 38 × 23 cm and has the curious feature of being made up of two

different pieces sewn together using simple tacking stitches 14–15 mm long. The thread used is 1 mm thick and S2z-ply. The same type of thread was also used to create a double whip/overcast stitch in a finer end of the same fabric. This also contains remains of a very simple edge. It is possible that the whip-stitching connected the two types of fabric. Both fabrics are 2/2 twills but they differ in terms of thread thicknesses. Single threads were used on the larger and finer quality fragment: what is probably the warp is made of loosely z-twisted threads (0.3 mm thick), while the weft is made up of hard s-twisted threads (0.4–0.6 mm thick). The result is a compact fabric which has 19/16 threads/cm. The thicker fabric, which is sewn onto the previously mentioned one, has the same twist direction combination but the thread thickness varies between 0.5 and 1.2 mm in one direction (the z twisted threads) and 0.3 to 1 mm in the other (in the case of the s-twisted threads). There are 6/7 threads/cm in the best preserved areas.

A few, small, wool textile remains were also found in 1999 at the Roman site of Las Ermitas, Vitoria (Filloy 2000). They were adhering to various iron instruments including sheep bells, picks and a ring that was undoubtedly connected to a harness (Alfaro 2004). The site began in the Julio-Claudian period (around the middle of the 1st century AD) and remained inhabited until the beginning of the 6th century AD. The preserved textiles date to the 4th century AD. It is possible that these valuable instruments were wrapped up in a cloth to protect them. The raw material used to produce the textiles is wool and its conservation is due to mineralisation. The weave is tabby and a small fragment preserves a tablet-woven edge.

Conclusions

Textiles from Spain, of which some representative examples have been discussed here, constitute an interesting group of finds that can tell us about the techniques developed by many of the different cultures that inhabited the Iberian Peninsula over time. The preservation conditions of these textiles differ greatly over such a vast area and time span.

In terms of raw materials, linen plays a prominent role in our collections, combined with hemp, the latter especially used for fishing nets. Hispanic linen was renowned in Roman

times (Alfaro 1984; Gleba 2008; Alfaro 2010). Linen is continually present from prehistoric times to the Roman age. The quality of the weave in this fibre is always very high. Tabby predominates, but some very well preserved examples of 2/1 and 2/2 twills also exist. The thread counts range between 4 and 32 threads/cm.

Wool must have been a fibre heavily used in northern and inland Spain, where it is intensely cold for many months of the year. However, few fragments of wool textiles survive. For wool, 2/2 twill seems predominant, as is the case throughout Europe in ancient times (*cf.* various authors in this volume). In terms of twist direction, there are more examples of z-twisted than s-twisted yarn.

Original text translated from the Spanish by Gillian Eaton.

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SWEDEN

Early Neolithic period	4100–3300 BC
Middle Neolithic period	3300–2300 BC
Late Neolithic period	2300–1800 BC
Early Bronze Age	1800–1100 BC
Late Bronze Age	1100–500 BC
Pre-Roman Iron Age	500–1 BC
Roman Iron Age	AD 1–400
Migration period	AD 400–550
Vendel Age	AD 550–750
Viking Age	AD 750–800

SWEDEN



Map 17.1. Sweden. Sites mentioned in Chapter 17.

Sweden

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Introduction

This chapter provides an overview of the archaeological textiles from the Bronze and Early Iron Ages in Sweden. Some 48 recorded textile finds are dated to the Bronze Age, two items are dated to the Pre-Roman Iron Age and 53 are dated to the Roman Iron Age (Bender Jørgensen 1986; Nockert 1991; Sundström 2010). By far the greatest part of the textile finds in Sweden has been recovered from burial sites, while finds from other contexts such as bogs are rare. Only two major bog finds are known from the Pre-Roman Iron Age, a textile and a skin garment. From the Roman Iron Age there is also a settlement site find and a textile from a weapon deposit (Nockert 1991). The majority of the few textile finds are from the southern and middle part of Sweden. The largest textile collection in Sweden is currently housed in the National Historical Museum of Sweden in Stockholm (*Statens historiska museum*). Other museums which have prehistoric textiles in their collections are, among others, the Malmö Museum, the Västmanland County Museum and the Lund Historical Museum.

Chronological and Cultural Background

Sweden belongs to the Scandinavian cultural area, but has a varied topography with diverse ecological regions and different climate zones. Present-day Sweden covers an area of 450,000 km², and from north to south the country is more than 1650 km in length. A large part of Sweden is dominated by extensive forests and mountains, while some areas, especially in the southern regions, have a fertile lowland. Sweden has a long coastline and there are many rivers as well as inland lakes. Several islands also belong to Sweden, *e.g.* Öland and Gotland, both occupied since the Stone Age (Welinder *et al.* 1998).

In general, it is considered that southern and central Sweden belong to the south Scandinavian cultural area together with Denmark and the southern part of Norway, while the northern part (mainly the province of Norrland) belongs to the north Scandinavian cultural area, together with northern Norway and Finland. However, it is important to note that over time there have been (and still are) many regional differences and cultural traditions that have profoundly affected everyday life

(Welinder *et al.* 1998; Burenhult 1999a; 1999b). In the following, a brief overview is provided on the Swedish Bronze and Early Iron Ages, with the primary focus on the southern and middle parts of the country.

The diversity of the landscape and the fact that Sweden belongs to different climate zones has always affected the inhabitants of the country. This is reflected in the archaeological record, for example, in the introduction and development of agriculture and the use of, and need for, textiles and textile production. This is also pertinent when discussing different archaeological periods and the development of various cultures.

Swedish prehistory is characterised by small-scale societies initially dependant on fishing, hunting and gathering and later, in some areas, agriculture (Burenhult 1999a; 1999b; *cf.* Halvorsen, Mannering *et al.* in this volume). The Swedish Bronze Age in the south Scandinavian cultural sphere is dated from *c.* 1800 to 500 BC. The Early Bronze Age covers the period from *c.* 1800 to 1100 and the Late Bronze Age from *c.* 1100 to 500 (Welinder *et al.* 1998; Olausson 2004). In northern Sweden, the chronological division is slightly different than in the archaeological record in the southern parts. For example, the Early Bronze Age culture did not spread to this region. Around 800 BC, the entire northern part of Norrland primarily adapted traditions from the north-east (eastern Russia), while central Norrland adopted new traditions mainly from the south (Baudou 1992).

Agriculture was introduced in Sweden in the Early Neolithic period. Within a few generations, animal husbandry and the cultivation of crops spread across the southern and central part of the country and continued to spread further north especially along the Baltic littoral and Bottenviken. By the beginning of the Early Bronze Age, agriculture was established in southern and central Sweden and on a small scale along the coastline in northern Sweden. It is noteworthy that animal husbandry was as important as crop cultivation, and in many regions fishing, hunting and gathering continued to be essential. Sheep became common already during the Early Neolithic period, but were probably used primarily for meat and milk. From *c.* 2000 BC onwards sheep with more varied horn sizes as well as hornless sheep

become more common, possibly indicating the introduction of sheep for wool. Flax as a crop was not introduced until the Late Bronze Age but the Early Bronze Age people had access to other plant fibres suitable for textiles, for example nettle that naturally grows near human habitations (Welinder *et al.* 1998). The Early Bronze Age inhabitants lived on single farms, which were organised around a central, one- or two-nave longhouse. From *c.* 1500 BC, house-building technology changed and the three-nave house became more common. The exact number of people who lived together in such dwellings is still open to discussion. Based on ethnographic studies, it has been suggested that one farm during this period could accommodate about 30 people, but the current view is that it was a relatively small group of people. They were most likely part of an extended family consisting of around 4–6 adults and 2–4 children (Welinder *et al.* 1998). It is impossible to ascertain the scale on which textiles were produced during this period.

Only very few spindle whorls and loom weights have been found. Even if textiles were produced, it is plausible that skin garments were still in common use. However, it is important to note that yarn could have been spun with a spindle rod made of wood, and that a fabric could be woven on a two-beam loom, and such tools are rarely preserved or correctly interpreted as being textiles tools.

In terms of material culture, this period is not very different from the previous Neolithic period. Objects of metal, primarily copper, have been found in Sweden already from the Early Neolithic period onward. By 2000 BC, metal objects were used in the prestige goods exchange system. It is clear that many bronze items were also produced locally, even if raw materials had to be imported. Nordic Bronze Age craftspeople were highly skilled and developed their own style (Olausson 2004). The metal and other objects demonstrate that Sweden was integrated within the extensive European exchange system. The few Swedish textile finds dated to this period, similar to the textiles from the Danish oak coffins, also indicate that the textiles produced were of high quality (*cf.* Mannering *et al.* in this volume).

During the Early Bronze Age, the late Neolithic traditions of burials in stone cists and flat-earth burials continued. However, during the same period, two forms of monumental

burials, mounds and cairns were also built, influenced by the central European Tumulus culture. Early Bronze Age funerary practices comprise inhumation in a stone or oak coffin, but cremation burials in a stone cist or a stone or oak coffin have also been noted. Most Bronze Age mounds occupy flat ridges in the landscape, whereas the cairns are positioned on hilltops or other prominent features in the landscape (Olausson 2004). The choice of burial type followed the dictates of natural topography and geography, with turf mounds dominating in areas where stone is less plentiful, as in Scania in southern Sweden (and also in Denmark). Cairns, on the other hand, are found in hilly and boulder strewn terrain (Borg *et al.* 1995; Burenhult 1999a; Olausson 2004). Many of these mounds and cairns have been reused as graves during the Late Bronze and Early Iron Ages. The number of items found in the burials is in general large, and includes not only bronze or other metal objects like jewellery and weapons, but also textiles, skins and furniture. The Bronze Age textiles of Sweden derive exclusively from turf mounds found in southern Sweden.

How the monumental Bronze Age mounds and cairns are to be interpreted is disputed. It has been suggested that they are the graves of high-ranking families. Another theory is that it is the tomb itself which is important, not the person buried in the grave. Just as in the case with the megalithic graves of the Stone Age, the big mounds and cairns required a major communal effort to build, being labour-intensive and requiring significant expenditure of resources and time. The monumental tombs became landmarks that advertised the inhabitants of the landscape (Burenhult 1999a; Olausson 2004).

Numerous Bronze Age rock carvings have been found in Sweden, located near rivers and wetlands. Important areas are the provinces of Bohuslän, Uppland and Östergötland where thousands of stone carvings have been found (Larsson 1994). The carvings are probably symbolic depictions and represent among others, horses, wheels, boats and people, the latter often unclothed but sometimes wearing garments. Of particular interest are the carvings, which have been interpreted as representations of cloaks or other garments. The rock carvings of cloaks are primarily from central Sweden (Malmer 1989). Noteworthy

features of the carvings are that they are life-size and that the pattern of the cloaks is identical to the kidney-shaped wool cloaks from Denmark (*cf.* Mannering *et al.* in this volume).

During the latter part of the Bronze Age, *c.* 1000–800 BC, a new farm structure emerged with smaller longhouses, outbuildings and possibly byres and permanent fields that were cleared of stones and fertilised (Welinder *et al.* 1998). Both crop cultivation and animal husbandry expanded, but the number of the members in a household is considered to be more or less identical as in the earlier period. The majority of the inhabitants still lived in single farms, but there is also evidence for clusters of farmsteads, which have been interpreted as small villages (Olausson 2004). Sheep were common and now flax was also cultivated. However, there is an ongoing debate on whether flax could have been used as a textile fibre since no linen textiles have been found so far (Welinder *et al.* 1998). Scarcely any textile tools are recorded from this period, but it is plausible that the tools used were made of perishable materials.

The tradition of building large burial mounds disappeared during the Late Bronze Age (Burenhult 1999b), and burial grounds with less conspicuous grave forms, such as flat earth burials and stone settings became common instead. The majority of all burials were now cremation burials in a stone cist or urn deposited in pits. The number of grave goods diminished, with bronze items and prestige objects being rare in the graves. These status symbols were now more commonly placed in sacrificial deposits (Olausson 2004). The textiles found in burial contexts are most often remains of cloth that were wrapped around the cremated bones in the urn (Burenhult 1999a).

The Iron Age in central and southern Sweden started around 500 BC and is divided into the Pre-Roman and Roman Iron Age. Much of the recent research has demonstrated that the transition between the Bronze Age and Iron Age was gradual (Burenhult 1999a). Via contacts and exchange, the bronze workers had already adapted iron metallurgy *c.* 1000–700 BC. Furthermore, iron was more accessible in the form of bog iron, which was locally available in Scandinavia, with the consequence that the long distance trade routes important in the Bronze Age lost their significance. Another effect was that iron was more available than bronze, and

this may have resulted in a rise in economic affluence at the transition from the Bronze Age to the Iron Age. However, it was not before *c.* AD 200 that iron was produced on a large scale (Olausson 2004). The Swedish Pre-Roman Iron Age (*c.* 500–1 BC) is generally known as a period of few finds. This is true with respect to the quantity of grave gifts and prestige objects, which may be due to the change in trade routes in Central Europe (Vandkilde 2004; Olausson 2004). During the 1st century BC, there is evidence for Scandinavia again being included in the European trade networks (Olausson 2004). On the other hand, this period is rich in information on farms and fossil farmlands with stone boundaries, clearing cairns, field boundaries and house foundations (Welinder *et al.* 1998). The settlements are still agrarian but there are some changes in the settlement structures and there is evidence that people lived in the same territory for much longer periods and thereby utilised the natural resources in a slightly different way (Olausson 2004). The farms still consisted of a longhouse and a varying number of outbuildings, the same pattern that is recorded from the Late Bronze Age. Sheep rearing and flax cultivation are common but there are still almost no finds of textile tools. It should also be noted that textile tools are rarely recovered in Denmark either, even though complete textiles survive there (*cf.* Mannering *et al.* in this volume). To conclude, one cannot exclude textile production, despite the few finds of woven textiles and textile tools, even taking the importance of skin and fur into consideration.

At the beginning of the Pre-Roman Early Iron Age, cremation was the most common burial form. The graves were covered by flat stone settings, standing stones, or the so-called *domarringar* stones erected in a circle or other formations. In the beginning of this period, burial gifts are in general few and simple, but this changes by the beginning of the next period, the Roman Iron Age (*c.* AD 1–400), when the graves became more elaborate with the inclusion of lavish grave goods and food and drinks for the deceased (Olausson 2004). The inhumation ritual was reintroduced during the Roman Iron Age, constituting about half of all burials examined. The tombs, however, are often constructed as low stone settings with only a thin layer of turf on top (Borg *et al.* 1995; Olausson 2004).

During the Roman Iron Age, the inhabitants of Scandinavia came into contact with the Roman Empire, as indicated by the appearance of Roman bronze and glass vessels, bronze figurines and coins. Together with these objects, new ideas and habits spread via the Roman Empire and the Germanic societies north of the Limes. Yet, Roman influence was rather indirect and Sweden was never under Roman control (Olausson 2004). Furthermore, a more stratified society that gradually developed during the Roman Iron Age, and the appearance of rich warrior graves are indicative of Roman influence on the local Swedish communities (Burenhult 1999; Olausson 2004). The Roman Iron Age society is considered to have had a hierarchical system in which the social position of the individual was determined by his or her position in the family. There were of course also differences between various families, from the leading families at the top to the slaves or serfs at the bottom of the social hierarchy (Olausson 2004). It is plausible that the social ranking was demonstrated through their costumes but also through other textiles, such as furnishing textiles (tapestries) which are known from the Late Iron Age.

At the onset of the Roman Iron Age, there was a significant change in the building technology of houses. As in the Early Bronze Age, some houses were very long, 40–50 m, and a house could have several rooms. The house-building traditions are well-known from AD 200, and different regional variations may be discerned. Ecological, social and economic relationships are evinced through a study of these buildings, and in the structures of the settlements and settlement areas. Pit houses, probably workshops with various functions appeared in settlements. Finds of loom weights and spindle whorls become more common at this time, but the numbers are still very low in comparison with the Viking Age (Andersson 1996, 2003).

A differentiation between various types of settlements is now also attested in the archaeological record. At the end of the Roman Age, fortifications became common especially on the north-west coast, the Mälär Valley and the islands of Öland and Gotland (Welinder *et al.* 1998). Large central places with evidence for elaborate craftwork, for example Uppåkra in Scania were established (Olausson 2004). It has been suggested that, during this period, a

centralisation of political powers via control of the exchange of goods begins to emerge (Olausson 2004). The results of strontium isotopic tracing analysis of textiles (Frei *et al.* 2009a; 2009b) have clearly demonstrated that raw material such as wool has been a part of the exchange network. It is therefore also of crucial importance to include textiles as an important factor in this discussion.

As mentioned above, there are few traces of textile production from the Swedish Bronze and Early Iron Ages. However, despite this, since textiles have played a crucial role in society, it is important to take them into account in the general archaeological discussion.

Research History

Research into Swedish prehistoric textiles has a long history which started at the end of the 19th century, when excavations began on Birka, the island of Björkö in Lake Mälaren. To date, Birka has yielded the most important and complex archaeological textile finds in Sweden dated to the Viking Age. Research on the Birka textiles has resulted in many publications, one of the most important being Agnes Geijer's *Birka III* (1938). The textiles from Birka were investigated again in 1974 by Inga Hägg, who concentrated in particular on the female dress in Birka.

Lise Bender Jørgensen was the first to provide an overview of Swedish prehistoric textiles (Bender Jørgensen 1986). Her overview of and conclusions on prehistoric Swedish textiles still stand unsurpassed today. Another important scholar of pre-Viking Age textiles in Sweden is Margareta Nockert. Her publication on the Högom find and other Migration period textiles includes a catalogue of Roman Iron Age textiles in Sweden (1991). Other Swedish textile finds are published in small contributions in monographs in the context of particular sites, as for example Valsgärde in Uppland (Arwidsson 1942; 1977). The unique Gerum Cloak, found in a bog has also received much attention (von Post *et al.* 1924–25, 27–32; Franzén and Lundwall 2006; 2009).

Bronze Age (1700–500 BC)

The surviving Bronze Age textiles come from a limited area of Sweden, the majority from Scania and Halland (Table 17.1). Here, the

burial mounds were constructed of peat which helped to preserve these textiles. The fragments are all very small, but homogeneous and exclusively tabby-woven. With few exceptions, the thread counts are 4–6 threads/cm in one direction and 3–4 threads in the other (Fig. 17.1). The twist direction combinations vary, with s/s, s/z or z/s twist combinations noted. All fragments are dark brown in colour, irrespective of the type of burial in which they were found. Two finds are described in detail here.

The first is typical for the period and consists of several textiles from Dömmestorp in Halland (Bender Jørgensen 1986, 232 nos 8–10). The site of Dömmestorp comprises at least 16 burial mounds, located close to each other and dated from the Early to Late Bronze Age. Textiles have been recovered from four different mounds, nos. 5, 8 and 10 and an unidentified fourth, excavated in different years. A stone cist in mound no. 5 contained textile fragments together with cremated bones. The same mound also yielded a bronze sword, a bronze knife, a small pair of bronze tweezers and pieces of birch bark and wood. The textile finds comprise about 20 small tabby fragments and loose threads (Fig. 17.2). They have 4–5 s-twisted threads/cm in one direction and 3 z-twisted threads/cm in the other direction. The textile, which probably comes from mound no. 8 at Dömmestorp, measures about 9×10 cm and has 5 s-twisted threads/cm in one direction and 4 z-twisted threads/cm

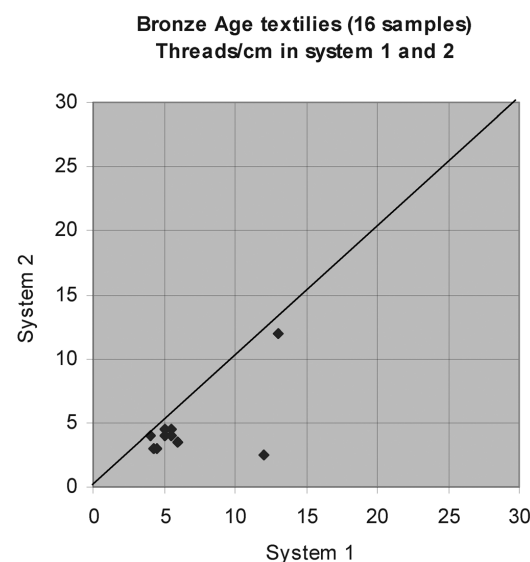


Fig. 17.1. Warp and weft thread counts in Bronze Age textiles of Sweden.

FID	Inv no.	Site, parish, province	Type of grave	Fibre sI/sII	Twist sI/sII	Threads/cm sI/sII	Yarn diameter sI/sII (mm)	Weave	Description
209026	SHM 7027:14	Eldsberga prästgård, Halland	mound, oak coffin	wool/wool	s/?	4/4	-	tabby	-
209027	SHM 7027:15	Eldsberga prästgård, Halland	mound, oak coffin	-	-	-	-	-	-
373692	SHM 7027:17	Eldsberga prästgård, Halland	mound, oak coffin	wool	s	-	-	threads	-
373693	SHM 7027:17	Eldsberga prästgård, Halland	mound, oak coffin	wool?	s, z	-	1	threads	probably from a fabric
373713	SHM 18667:12	Dömmestorp, Hasslöv, Halland	mound	wool?	z, s	-	1	threads	unusual dark colour
373719	SHM 3987:5c	Dömmestorp, Hasslöv, Halland	mound, stone cist	wool?	z, s	4	1-1.5	threads	probably from a fabric
373743	SHM 28978:8	Dömmestorp, Hasslöv, Halland	mound, urn	wool/wool	s/z	4/4	-	tabby	-
373749	SHM 3987:5c	Dömmestorp, Hasslöv, Halland	mound, stone cist	wool/wool	s/z	4-5/3	-	tabby	distinct volume, yarn diameter varies
268342	SHM 4168:10a	Dömmestorps gods, Hasslöv, Halland	mound, stone cist	wool/wool	z/s	6/4	-	tabby	-
268343	SHM 4168:10a	Dömmestorps gods, Hasslöv, Halland	mound, stone cist	wool/wool	z/s	6/4	-	tabby	-
274337	SHM 4168:10a	Dömmestorps gods, Hasslöv, Halland	mound, stone cist	wool/wool	z/s	6/4	-	tabby	-
274338	SHM 4168:10a	Dömmestorps gods, Hasslöv, Halland	mound, stone cist	wool/wool	z/s	6/4	-	tabby	-
373720	SHM 4168:10a	Dömmestorps gods, Hasslöv, Halland	mound, stone cist	wool/wool	s/z	4-5/3	-	tabby	distinct volume
373722	SHM 4168:10a	Dömmestorps gods, Hasslöv, Halland	mound, stone cist	wool/wool	z/s	6/3-4	1.5-2/ 1.5-2	tabby	uneven
373724	SHM 4168:10a	Dömmestorps gods, Hasslöv, Halland	mound, stone cist	wool/wool	z/s	6/3-4	1.5-2/ 1.5-2	tabby	-
372698	SHM 18348	Hasslöf 13, Hasslöv, Halland	mound	wool?/wool?	s/s	4/4	1-2/1-2	tabby	disintegrated
373703	SHM 18348	Hasslöf 13, Hasslöv, Halland	mound	wool?/wool?	s/?	12/2-3	1-2/?	tabby	densely warped, possible starting border c. 2 cm
373725	SHM 18323	Lugnaro, Hasslöv, Halland	mound	wool?/wool?	s/?	-	1.5-2/?	tabby?	very disintegrated
274341	SHM 17692	Laholm, Halland	mound, urn	wool/wool	s/z	5/4	-	tabby	very flattened
274342	SHM 17692	Laholm, Halland	mound, urn	wool/wool	s/z	5/4	1.5-2/ 1.5-2	tabby	almost square tabby, very flattened
373750	SHM 17692	Laholm, Halland	mound, urn	wool/wool	s/z	5/4	-	tabby	-
373753	SHM 8628	Björlov, Färlöv, Skåne	mound	wool/wool	s/z	5/4	-	tabby	discoloured, the threads were close to each other

274359	SHM 8628	Björlov, Färlöv, Skåne	mound	wool/wool	-	5/4	-	tabby	felted
274360	SHM 8628	Björlov, Färlöv, Skåne	mound	wool/wool	-	4-5/4	-	tabby	-
274361	SHM 8628	Björlov, Färlöv, Skåne	mound	wool/wool	s/z	4-5/4	-	tabby	-
274339	SHM 9169:BIII	Hammarlöv by, Hammarlöv, Skåne	mound	wool/wool	s/z	5/4	-	tabby	-
274340	SHM 9169:BIII	Hammarlöv by, Hammarlöv, Skåne	mound	wool/wool	s/z	5/4	-	tabby	probably the same fabric as fid 373763 and 274339, fulled
373763	SHM 9169:BIII	Hammarlöv by, Hammarlöv, Skåne	mound	wool	s, z	-	-	threads	-
373765	SHM 9169:BIII	Hammarlöv by, Hammarlöv, Skåne	mound	wool	S4z	-	-	cord	4-ply
373768	SHM 6636:d	Stora Köpinge, Köpinge, Skåne	mound, oak coffin	wool/wool	s/z	5/4	-	tabby	thread system I finer than II, II also has more fullness
274343	SHM 8102	Vestra Grevie, Mellan-Grevie, Skåne	mound, oak coffin	wool/wool	s/z	4-5/3	1-2/2	tabby	distinct volume
373772	SHM 8102:b9	Vestra Grevie, Mellan-Grevie, Skåne	mound, oak coffin	wool/-	s, z	-	-	threads	z-twisted threads more disintegrated
373775	SHM 8102:b9	Vestra Grevie, Mellan-Grevie, Skåne	mound, oak coffin	wool/-	s, z	-/-	-	threads	s-twisted threads dominate
373776	SHM 8102:5-6,1a	Vestra Grevie, Mellan-Grevie, Skåne	mound, oak coffin	wool/-	s, z	-/-	-	threads	-
373777	SHM 8102:b9	Vestra Grevie, Mellan-Grevie, Skåne	mound, oak coffin	wool/wool	s/z	5-6/4	-	tabby	z-twisted thread is thicker and looser than s-twisted thread
274344	SHM 9822:834	Unknown find place, Skåne	-	wool/wool	s/z	3/3	2/?	tabby	plaited starting border
373817	SHM 15767	Glädjebacken, Trelleborg, Skåne	mound, oak coffin	wool	s	-	-	thread	-
373818	SHM 15767	Glädjebacken, Trelleborg, Skåne	mound, oak coffin	wool/wool	s/s	5/4	-	tabby	distinct interstices between the binding threads
373819	SHM 15767	Glädjebacken, Trelleborg, Skåne	mound, oak coffin	wool/wool	s/s	5/5	-	tabby	probably the same fabric as fid 373818 but more compressed
373778	SHM 8175	Österslöv nr 1, Österslöv, Skåne	mound	wool/wool	s/z	5-6/4-5	-	tabby	-
416729	SHM 12561:7 ²	Benestad, Aringsås, Småland	stone cist	plant?/plant?	s ² /z ²	13/12	-	tabby	possibly plant fibre

in the other. A small stone cist in the middle of mound no. 10 contained a bronze dagger with a horn handle, together with cremated bones. The yarn diameters vary considerably. The bones and the dagger were covered by a

wool textile, which now consists of about 50 small dark brown tabby fragments with 4–4.5 s-twisted threads/cm in one direction and 4 z-twisted threads/cm in the other. There are also a number of fragments with 6 z-

Table 17.1. Textiles from the Bronze Age in the collections of the National Historical Museum, Sweden.



Fig. 17.2. (top) A typical Bronze Age textile, Dömmestorp, SHM 3987:5c (FID 373749) (Photo: C. Åhlin, National Historical Museum, Sweden).



Fig. 17.3. Plaited starting border turning into a tabby weave, Scania, unknown site, SHM 9822:834 (FID 274344) (Photo: C. Åhlin, National Historical Museum, Sweden).

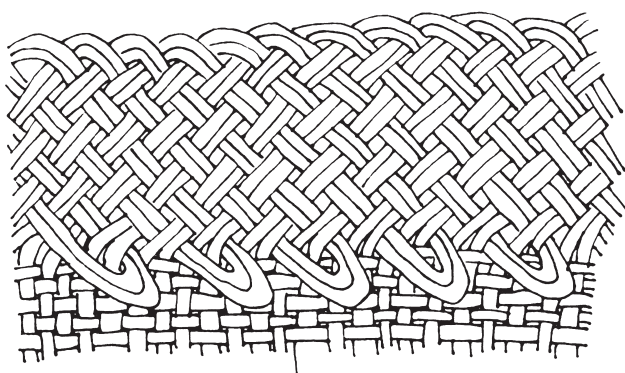


Fig. 17.4. Drawing of plaited starting border, Scania, unknown site, SHM 9822:834 (FID 274344) (Drawing: A. Sundström).

twisted threads/cm in one direction and 3–4 s-twisted threads/cm in the other. It is very hard to ascertain if these are fragments of two different fabrics or if they belong to the same weave. Judging by the thread count, they could be from two different fabrics, but their

visual appearance indicates that they may in fact belong to the same fabric. The final fragment (SHM 18667:12, FID 373713) comes from an urn burial from an unknown mound. Today, the find consists only of loose z and s-twisted thread remains, but an old illustration shows that the fabric was originally woven in tabby.

The other Bronze Age find of special interest is a relatively large fragment with a starting border from an unknown location in Scania. The textile (SHM 9822: 834, FID 274344) is a fragment of coarse wool tabby, measuring approximately 15 × 15 cm (Fig. 17.3). Closer investigation has demonstrated that the starting border is plaited (Sundström 2010). The plaiting was done by hand using two threads: alternate pairs of threads continue to form the tabby weave, while the remaining pairs of threads end in a loop at the transition from plait to weave. Thus the plait contains twice as many threads as the weave. The plaiting must have been made before the weaving began because one pair of threads is joined in a loop with another pair located two threads away (Fig. 17.4). The warp is s-twisted, the weft z-twisted and there are 3 threads/cm in both warp and weft. The textile was ¹⁴C-dated to 1390–1120 BC. The thread count, colour and spin direction of the fragment are similar to those of the other Bronze Age textiles. Textile finds with plaited borders from the Early to the Late Bronze Age have also been found in Hallstatt, Austria (*cf.* Grömer this volume); one of them is a starting border because both threads go into the tabby weave after the plaiting. The difference between the Austrian and the Swedish finds is that in the latter, all the threads continue the weave, whereas in the former, only alternate threads go down to form the tabby weave. Plaited borders are also known from the Bronze Age Danish finds (*cf.* Mannering *et al.* in this volume).

In addition to the textile finds, a Late Neolithic find from Bolagsbacken in Scania has been interpreted as a flax swingle. Important evidence for flax retting in the Late Bronze Age is provided by the discovery of flax bunches in Lake Bokarn in Uppland. They are possibly remains of flax retting. A growing number of linseed finds are also dated to the Late Bronze Age (Welinder *et al.* 1998). It is still uncertain whether the flax fibre was used for making textiles. Studies of bones from sheep and goats from the Bronze Age dwellings demonstrate that large numbers of older

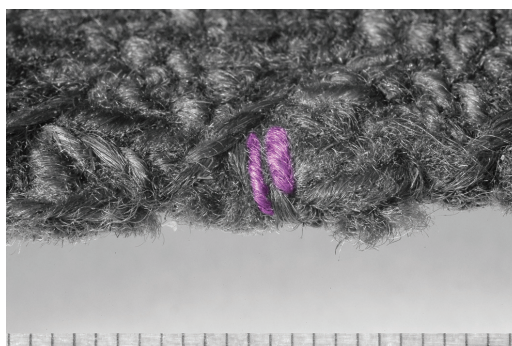


Fig. 17.5. (left column top) The Gerum Cloak, SHM 16719 (FID 266931) (Photo: G. Hildebrand, Swedish National Heritage Board).

Fig. 17.6. (left column bottom) Detail of the cloak's dogtooth pattern and one of the gores woven into it, Västergötland, Parish of Östra Gerum, SHM 16719 (FID 266931) (Photo: G. Hildebrand, Swedish National Heritage Board).

Fig. 17.7. (top) Detail of the Gerum cloak's selvage (Photo: G. Hildebrand, Swedish National Heritage Board).

Fig. 17.8. (centre) Detail of the Gerum cloak's reversed warp threads and overcast stitch in 2-ply wool yarn (Photo: G. Hildebrand, Swedish National Heritage Board).

Fig. 17.9. Light weft thread from the Gerum Cloak (Photo: J. Netrval, Royal Institute of Technology, Sweden).

animals were kept, presumably indicating that wool production had become more common.

Pre-Roman Iron Age (500–1 BC)

Due to the prevailing custom of cremation burial, only a few textile finds date to the Pre-Roman Iron Age (Table 17.2). These are a find from Fole Prästgård on the island of Gotland (SHM 27760, FID 374670) and the Gerum Cloak (see below). In addition to these two finds, there are several large fragments of a cut and sewn calfskin from the Stora Fagerås bog in the parish of Norra Åsarp, Västergötland (SHM 20709), found deposited in a bog, a possible garment. It is ^{14}C -dated to 400–17 BC (Knape and Nockert 1996, 43–44). The

Roman Iron Age textiles (19 samples) Threads/cm in system 1 and 2

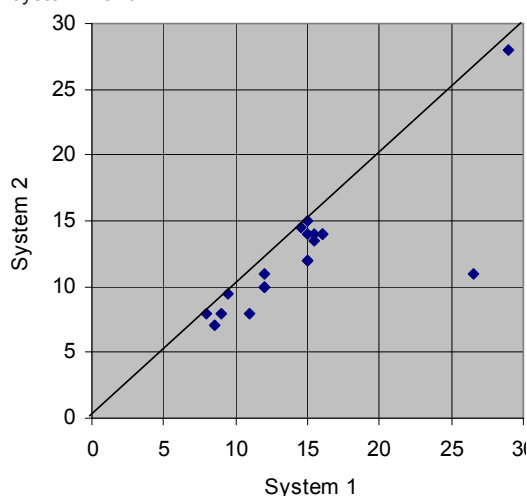


Fig. 17.10. Warp and weft thread counts of Roman Iron Age textiles from Sweden.

FID	Inv no.	Site, parish, province	Context	Fibre sI/sII	Twist sI/sII	Threads/cm sI/sII	Yarn diameter sI/sII (mm)	Weave	Description
374670	SHM 27760	Fole prästgården 1:1, Fole, Gotland	grave	wool? /?	-	-	-	-	-
266931	SHM 16719	Hjortmossen, Östra Gerum, Vg	bog find	wool/wool	s/s	7-8/7-8	0.75-2/ 0.75-2	2/2 broken twill	overspun yarn in warp and weft; irregularity in the weave
576819	SHM 413	Lilla Jored, Kville, Bo	burial chamber	wool/wool	s/z	14/12	-	2/2 twill	two fabrics fixed together
576827	SHM 413	Lilla Jored, Kville, Bo	burial chamber	wool/wool	z/s	16/14	-	2/2 twill	-
576870	SHM 7583	Bläsnungs, Västkinde, Gotland	grave	wool/wool	s/s	8-9/7	-	2/2 twill	-
412203	SHM 25960 0:35	Vallviksudden, Malmö, Varris, Vilhelmina, La	settlement	wool/wool	s/z	9/8	-	2/2 twill	long fibres
267621	SHM 23906	Horsta, Timrå, Me	grave	wool/wool	z/z	14-16/14	0.2-0.3/ 0.2-0.3	2/2 diamond twill	very fine fabric, same as fid 274345
274345	SHM 23906	Horsta, Timrå, Me	grave	wool/wool	z/z	14-16/14	0.2-0.3/ 0.2-0.3	2/2 diamond twill	very fine fabric, same as fid 267621
414019	SHM 8327: Ag	Bodarp by, Bodarp, Skåne	Östergötland	wool/?	-	-	-	-	-
267740	SHM 4792	Öremölla, Skivarp, Skåne	burial chamber	wool / -	S2z/?	100/20	-	tablet weave	-
414024	SHM 4792	Öremölla, Skivarp, Skåne	burial chamber	wool / wool	z, s	-	-	-	-
414024	SHM 4792	Öremölla, Skivarp, Skåne	burial chamber	wool / wool	z/s	29-30/28-29	-	diamond twill	-
414025	SHM 4792	Öremölla, Skivarp, Skåne	burial chamber	wool/?	-	-	-	tablet weave	very fine quality
414025	SHM 4792	Öremölla, Skivarp, Skåne	burial chamber	wool/wool	z/s	28/28	-	diamond twill	-
416741	SHM 25418:3:II	Lilla Vi nr 2:1, Djursdala, Småland	mound	wool/wool	z/s	15-16/13-14	0.5/0.5	2/2 twill	-
416741	SHM 25418:3:II	Lilla Vi nr 2:1, Djursdala, Småland	inhumation	wool/wool	S2z/z	16/14	0.5/0.3	2/2 twill	thread system I has more fullness
418086	SHM 20724	Söderby, Gamla Uppsala Fullerö, Uppland	cairn	wool/wool	z/s	15-16/14	-	2/2 twill	-
418087	SHM 20724	Söderby, Gamla Uppsala Fullerö, Uppland	cairn	-	z/z	12/10	-	2/2 twill	-
418090	SHM 20724	Söderby, Gamla Uppsala Fullerö, Uppland	cairn	flax?/flax?	z/z	14-15/14-15	0.4/0.4	tabby	-
418370	SHM 31873	Breneberga, Hägum, Vg	stone setting	wool/wool	z/z	-	-	threads	probably 2/2 twill; see fid 418372
418372	SHM 31873	Breneberga, Hägum,	stone setting	wool/wool	z/z	12/10	-	2/2 twill	thread system I is thicker

		Häggum, Vg							and tighter
576829	SHM 27334	Kinna kyrkogård, Vg	stone setting	wool/wool	z/z	14-16/12	-	2/2 twill	-
479995	-	Borgby, Säby, Vs	-	-	-	-	-	-	-
450526	SHM 27121:830	Skedemosse, Gärdslösa, Öl	sacrifice, deposit	wool?/wool?	z/z	8/8	-	2/2 twill	-
577619,577620	SHM 27702	Sörby Störlinge, Gärdslösa, Öl	stone setting	wool?/wool?	s/s	14-16/12	-	2/2 twill	-
418573	SHM 33786	Södra Kvinneby 17:1, Stenåsa, Öl	stone cist	wool?/wool?	s/s	9-10/9-10	0.9/0.9	2/2 twill	relatively coarse
418586	SHM 31134	Viby Bosgård, Viby, Östergötland	mound, cremation	wool/wool	z/?	32/?	-	tablet weave?	-
418586	SHM 31134	Viby Bosgård, Viby, Östergötland	mound, cremation	wool?/wool?	z/?	26-27/10-12	0.4/?	rep	very compact warp, weft is invisible
577621,577622	SHM 11746	Alvastra, Västra Tollstad, Östergötland	inhumation	wool?/wool?	z?/s?	14-16/14-16	-	2/2 twill	very fine quality, fulled

Table 17.2. Textiles from the Pre-Roman and Roman Iron Ages in the collections of the National Historical Museum, Sweden.



Fig. 17.11. (far left) Textiles from Öremölla, SHM 4792 (FID 267740) (Photo: C. Åblin, National Historical Museum, Sweden).

Fig. 17.12. Diamond twill, detail, Öremölla, SHM 4792 (FID 267740) (Photo: C. Åblin, National Historical Museum, Sweden).

seams are sewn with threads made of leather or sinew. Secured to the hide are leather straps which perhaps served to hold the garment together, suggesting that it may have been a cape similar to the items found in Danish bogs (*cf.* Mannering *et al.* this volume).

The Gerum Cloak

The Gerum Cloak (SHM 16719) was found in 1920, during peat digging in the Hjortmossen bog in the parish of Östra Gerum, Västergötland. It had been folded and deposited under three stones. The garment is fully preserved, oval in

shape and measures approximately 250 × 198.5 cm (Fig. 17.5 and see Table 17.2). The cloak was probably used as an outer garment that may have been worn in different ways depending on the wearer's needs. The cloak is unique by Swedish standards, as it is the only completely preserved prehistoric garment.

After its discovery, the cloak was dated to the Late Bronze Age (1100–900 BC) with the aid of pollen analysis. In 1995, the cloak was re-dated using ¹⁴C analysis, which provided a date between 360 and 100 BC, *i.e.* the Pre-Roman Iron Age (Nockert and Possnert 2002).

Fig. 17.13. Tablet-woven band, detail, Öremölla, SHM 4792 (FID 267740) (Photo: C. Åblin, National Historical Museum, Sweden).



Fig. 17.14. (right) Close-up of the tablet-woven band with weft threads dyed blue, Öremölla, SHM 4792 (FID 267740) (Photo: J. Netrval, Royal Institute of Technology, Sweden).



Fig. 17.15. Mineralised textile from a weapon deposit in a peat bog, Skedemosse, SHM 27121:830A (FID 576860) (Photo: C. Åblin, National Historical Museum, Sweden).



Fig. 17.16. Mineralised tabby weave, probably linen, Söderby, SHM 20724 (FID 418090) (Photo: C. Åblin, National Historical Museum, Sweden).



When the cloak was recovered, it had 32 narrow, oblong holes, concentrated in specific areas. Sune Lindqvist concluded that these holes had been made while the cloak was being worn folded double (von Post *et al.* 1924–25). He suggested that the holes had been made by a pointed weapon piercing the fabric, and that its wearer had received five stab wounds. The

large number of holes in the cloak was due to the five stabbings that penetrated several layers of cloth. In 2005, the Swedish National Laboratory of Forensic Science confirmed the theory that the person wearing it had been subjected to violence. The wearer had been stabbed and, probably, killed.

The cloak is made of wool and woven in 2/2 twill with reverse repeat in warp and weft, of s-twisted yarn. The point turns are very unevenly distributed across the weave in both warp and weft directions. The cloak has block checks that appear as a dogtooth pattern created by alternating four darker and four lighter threads in warp and weft (Fig. 17.6). The cloak was cut to an oval shape out of an originally square piece. The open, cut edges are hemmed with crisscross overcast stitches, using two-ply wool yarn. Roughly in the middle on all four sides, the cloak has short, straight sections (3–4 cm long), where the edges were not cut off. These sections have threads which turn back into the weave on all four sides of the garment, in both the warp and weft directions and continue into the weave (Figs 17.7 and 17.8; Franzén and Lundwall 2006; 2009). These technical details indicate that the cloak was produced with a tubular warp. In Denmark, Pre-Roman Iron Age bog finds include several tubular garments and textiles produced with a tubular warp (*cf.* Mannering *et al.* in this volume).

The presence of crossing weft threads indicates that at least two people were working together at the loom to create this textile (*cf.* Mannering *et al.* in this volume). The weavers had trouble with the weave, as during the weaving process the warp became irregular. To even out the irregularities, five gores were woven in – four on one side and one on the other (see fig. 17.6). The pattern is very skilfully linked into the gores, making them almost invisible.

Today, the cloak is in two different shades of brown creating a check pattern. Although the present colour of the cloak is brown due to tannin staining in the bog, the fibre analysis revealed that naturally brown and white wool fibres had been used. The white thread also contains isolated elements of brown fibres. The wool in the white and brown threads differs in fibre quality, the white being finer than the brown; however both contain kemp (Fig. 17.9). The sewing thread used around the edge was originally white.

The wool in the cloak is classified as a 'Mouflon type'. The Mouflon and Soay are the present-day breeds of sheep believed to resemble most closely prehistoric sheep (Ryder 1983). Both these sheep breeds have a fur with white underwool and brown hair. The element of brown fibres in the white wool of the Gerum Cloak suggests that the sheep was probably piebald. The finer white wool probably came from the underwool, while the coarser brown wool most likely came from the hair. Examination of the fibres also revealed that the wool was probably not shorn but either fell off naturally or was plucked from the sheep. The new test results indicate the presence of dye in both the brown and the white wool fibre. It is likely that the cloak was piece-dyed. Traces of luteolin, a flavone occurring in many natural yellow dyestuffs have been detected. The present colour of the cloak derives from the peat bog.

Furthermore, both warp and weft of the Gerum cloak has been recently analysed by a new geo-chemical tracing method using the strontium isotopic system (Frei *et al.* 2009a), in order to determine the provenance of the raw material. The results indicate that both yarns were non-local to the Hjortmossen bog area, but most probably from an area within southern Sweden (Frei 2009; Frei *et al.* 2009a).

Roman Iron Age (AD 1–400)

The Roman Iron Age textiles of Sweden represent a less homogeneous group than the Bronze Age textiles, displaying a much wider variety of techniques, thread counts and colours. These textiles also have a wider geographical distribution throughout Sweden (see Table 17.2). Nine sites have yielded textiles dated to the Roman Iron Age.¹

Altogether 36 different fabrics can be identified, including 25 examples of 2/2 twill, seven of diamond twill, one of broken twill, two of tabby and one of warp-faced tabby. The material also includes six tablet-woven bands and three different cords. Two groups can be discerned in this material, the first with a thread count of about 15 threads/cm in warp and weft, and the second with a thread count of 8–10 threads/cm in warp and weft (Fig. 17.10). The first group is slightly larger in number. All textile finds in this group come from weapon burials, which are often richly

equipped. The second group includes more varied textiles, which are found in burials with almost no weapons. The 2/2 diamond twill weave from Öremölla in Scania (SHM 4792) stands apart from the others, as it has a very high thread count and includes fragments of tablet-woven bands.

The finds from Roman Iron Age Sweden are here exemplified by the finds from Öremölla in Scania, Skedemosse on the island of Öland and Söderby in Uppland. They are representative of the Roman Iron Age material found throughout Sweden.

The Öremölla textiles (Geijer 1939; Ekholm 1943; Bender Jørgensen 1986, 234 no. 15), now in numerous fragments, come from a burial containing a wealth of imported Roman goods, such as two cut-glass beakers, a bronze cauldron, ladle and strainer (Fig. 17.11). The burial also included a fragment of an iron chain-mail hauberk and some weapons. All the textiles probably originate from the same costume. One of the textiles (FID 414025) consists of many fragments of a z/s-twisted 2/2 diamond twill with about 29–30 threads/cm in one thread system and 28–29 threads/cm in the other (Fig. 17.12). Among the preserved textile remains are fragments of a second diamond twill with a slightly lower thread count, but they could belong to the same fabric. Fragments of a tablet-woven band, the largest measuring about 2.5×3 cm were also recovered. The tablets were arranged in pairs with a density of 28 tablets/cm, resulting in 112 threads/cm. The weft consists of two single-spun threads of a bluish hue (Figs 17.13–17.14). The colours of the tablet-woven fragments range from yellowish brown to reddish brown and dark brown, indicating that there might have been two different bands. There are also two different cords, one Z2s-ply and the other S3z-ply. The textile finds from Öremölla are of very fine quality. Both the diamond twill fabric and the tablet-woven band have high thread counts. Traces of colour suggest that these textiles were dyed.

In the weapon deposit from Skedemosse on Öland (SHM 27121:830a), finds range chronologically from the Late Roman Iron Age to the Migration period. The surviving textile (SHM 27121:830A) was preserved on the side of a spearhead. The textile fragment is a 2/2 twill with 8 z-twisted threads/cm

in both systems (Fig. 17.15). This find has many similarities with the weapon sacrifices from Illerup Ådal, Denmark and Thorsbjerg, Germany (Möller-Wiering 2011; cf. Möller-Wiering and Subbert in this volume), where many weapons had been wrapped in cloth or in garments before being deposited in the bogs. In the Skedemosse find, textile is present on only one weapon and on only one side of the object.

The Söderby finds in Uppland (SHM 20724) come from an excavation of a cairn, which contained a burial on a north-south axis that had been looted in ancient times. This grave was a very rich weapon burial, containing, among other things, a gold finger ring with a large carnelian gem. The textiles (SHM 20724, FID 418090, 418086 and 418087) were found in the filling above the northern part of the burial, together with a silver buckle, a square, fluted, silver mounting, a number of ribbon-shaped silver mountings, and about 200 rings from the chain-mail hauberk. Another part of the filling contained a damaged comb, some coarse pottery sherds and a large number of animal bones. The textile fragments derive from three different fabrics. The first, consisting of nine fragments is a tabby, which has a thread count of 14–15 threads/cm in both directions, with z-twisted yarn. It is believed to be linen (Fig. 17.16). The second is a 2/2 twill with 15–16 z-twisted threads/cm in one system and 14 s-twisted threads/cm in the other system. The twill is far more distinct on one side. The last fabric is also a 2/2 twill but of a somewhat coarser kind, with 12 threads/cm in one system and 10 threads/cm in the other. Both systems have z-twisted yarn.

Conclusions

The Bronze Age textiles of Sweden are very homogeneous in terms of technique, quality and visual appearance. The technique is exclusively tabby weave. The most common twist combination is s/z, although a few fragments have the z/s combination. Two finds have the combination of s/s. As the fragments are too small to identify warp and weft, no further conclusions may be drawn concerning the occurrence of twist variations. The only fragment for which warp and weft directions have been reliably ascertained is a plaited starting border, which is s/z. The thread counts

for thread system I are 4–6 threads/cm and for thread system II 3–5 threads/cm.

The textile material from the Pre-Roman Iron Age is far too scarce to warrant any generalisations concerning technique, twist direction and other parameters. However, changes in the technique can be observed. The Gerum Cloak is made in a new technique, 2/2 twill with irregular reverse repeat in warp and weft. Another innovation is the use of two colours to produce a pattern. The textiles dating to the Roman Iron Age are more numerous, have finer qualities and are sometimes dyed. Decorative elements such as tablet-woven bands and cords also occur. The most common weaving technique is 2/2 twill. There are also examples of diamond twill, balanced tabby and warp-faced tabby. The textiles are predominantly made of wool. In terms of thread count, two groups may be distinguished, one with 8–10 threads/cm and another with about 15 threads/cm in both systems. The textiles from Öremölla in Scania also include a very fine diamond twill, with 28–30 threads/cm. Fragments of decorative elements in the form of tablet-woven bands and various cords were recovered as well.

With the exception of the plaited Bronze Age starting border and the Gerum Cloak, no selvages or borders are preserved. It is difficult to ascertain the type of loom for which the Bronze Age plaited starting border was created. An edge like this can certainly be set up in a warp-weighted loom, but one could also imagine a more rudimentary, horizontal kind of loom, or the whole fabric being plaited without any loom being used at all. The Gerum Cloak was probably woven on a loom with a tubular warp, while the finds of loom weights dated to the Roman Iron Age suggest the use of a warp-weighted loom during that period. Despite its mostly fragmentary nature, the Swedish textile material demonstrates the existence of a wide variety of techniques, evolving from the tabby weaves in the Bronze Age to several different twill techniques during the Roman Iron Age.

Acknowledgements

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Notes

- 1 The textile fragment from Prästergårde, SHM 17907:11 (Bender Jørgensen 1986, 234 no. 17) is no longer present on the object, probably due to later conservation treatment.
- 2 The dating of this find is problematic, as it may date to the 17th century AD.

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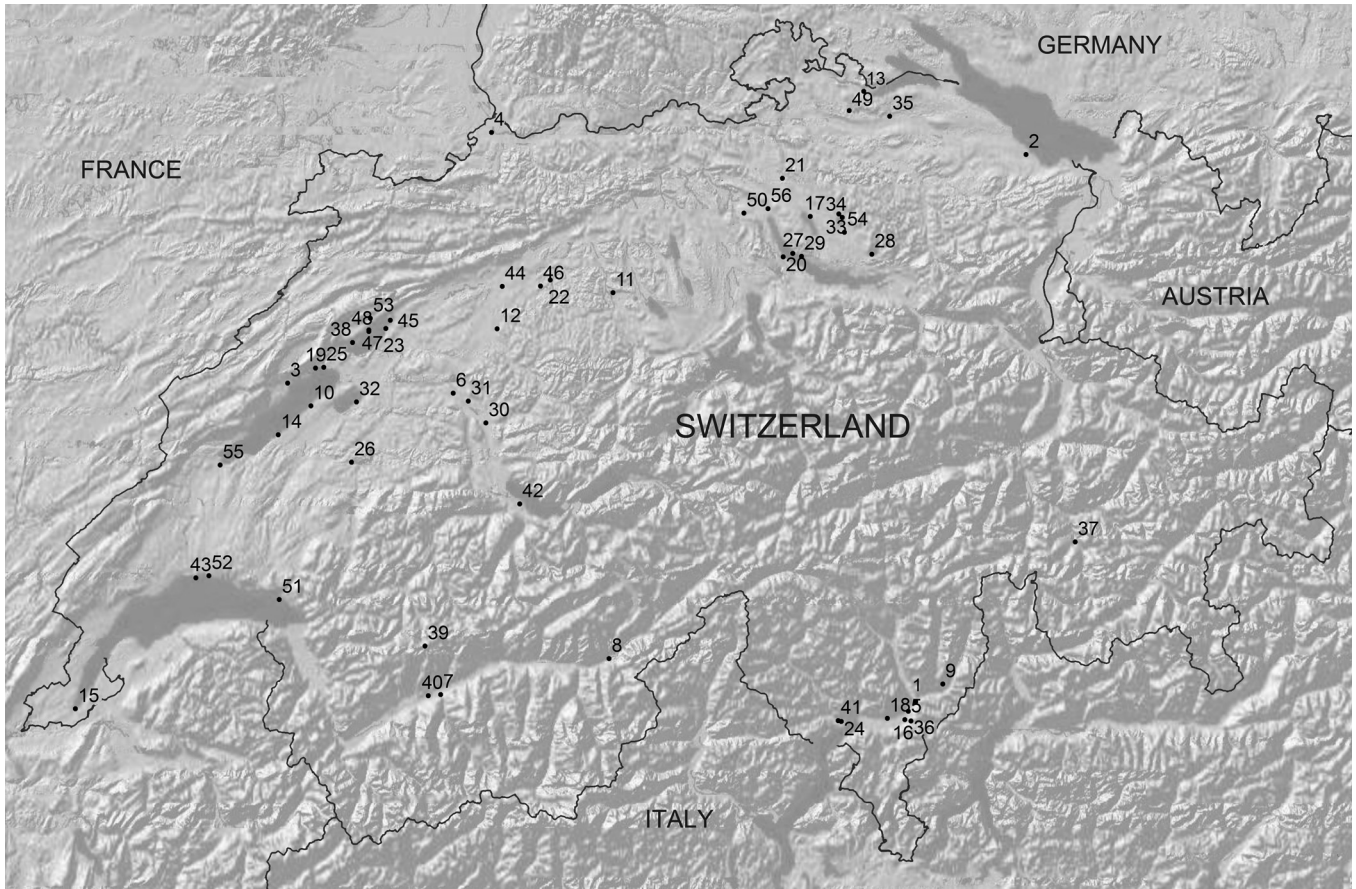
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SWITZERLAND

Neolithic period	4300–2200 BC
Early Bronze Age (Bz A)	2200–1700 BC
Middle Bronze Age (Bz B-C)	1700–1350 BC
Late Bronze Age (Bz D, Ha A-B)	1350–800 BC
Hallstatt C	800–600 BC
Hallstatt D	600–500 BC
La Tène A to La Tène D	500–16 BC
Roman period	16 BC–AD 400

SWITZERLAND



Map 18.1. Switzerland. Sites mentioned in Chapters 18 and 19:

- | | | |
|----------------------------|--------------------------|-------------------------|
| 1 Arbedo | 20 Horgen-Scheller | 39 Schnidejoch |
| 2 Arbon-Bleiche | 21 Kloten-Homberg | 40 Sion |
| 3 Auvernier | 22 Langenthal-Unterhard | 41 Solduno |
| 4 Basel | 23 Lattrigen | 42 Spiez-Einigen |
| 5 Bellinzona Castel-Grande | 24 Locarno | 43 St. Sulpice |
| 6 Bern | 25 Marin-Epagnier | 44 Subingen |
| 7 Bramois | 26 Matran | 45 Sutz-Rütte |
| 8 Brig-Glis | 27 Meilen | 46 Thunstetten |
| 9 Castaneda | 28 Meilen im Grund | 47 Twann |
| 10 Delley-Portalban | 29 Meilen Schellen | 48 Uerschhausen-Horn |
| 11 Egolzwil | 30 Münsingen | 49 Utikon-Üetliberg |
| 12 Ersigen | 31 Muri-Mettlen | 50 Vevey |
| 13 Eschenz | 32 Murten-Löwenberg | 51 Vidy |
| 14 Estavayer-La Tenevière | 33 Pfäffikon-Burg | 52 Vinelz-Strandboden |
| 15 Geneva | 34 Pfäffikon-Irgenhausen | 53 Wetzikon-Robenhausen |
| 16 Giubiasco | 35 Pfyn-Breitenloo | 54 Yverdon-les-Bains |
| 17 Greifensee-Böschén | 36 Pianezzo | 55 Zürich |
| 18 Gudo | 37 Savognin-Padnal | |
| 19 Hauterive-Champréveyres | 38 Schafis | |

Switzerland: Neolithic Period

Fabienne Médard

Introduction

This chapter examines textile production in the geographical region covered by present-day Switzerland during the Neolithic period. Found in wet, oxygen-free conditions, mainly in peat bogs, marshes and lakes, the Neolithic Swiss textiles are relatively well preserved. Besides the textiles, many other organic materials such as seeds, fruits, wooden objects (including textile tools) and items crafted from antler and bone have survived. The textiles are of particular interest as they represent some of the oldest finds of this nature discovered in Europe. They allow us to appreciate the extent of technical knowledge of the Neolithic populations from a rarely envisaged perspective and provide us with a fascinating glimpse of human innovation and craftsmanship.

Chronological and Cultural Background

The Alpine arc has yielded some of the earliest and most plentiful textile remains in west-central Europe. The oldest remains found to date have come from the site of Egolzwil (LU; Fig. 18.1)¹ and Kleiner-Hafner (ZU) and date to the second half of the 5th millennium

BC (Wyss 1994, 141–146; Suter 1987, 137). With the exception of these rare finds dating from the Palaeolithic and Mesolithic periods (Médard 2005), most remains have been recovered in Neolithic lake dwelling sites in Switzerland. The textiles are dated to the Middle Neolithic (Cortailloid and Pfyn cultures), Recent Neolithic (Horgen culture) and Final Neolithic (Corded Ware culture – groups Lüscherz and Auvernier-Cordé), comprising a period between 4300 and 2400 BC.

Recovered exclusively from settlement

Fig. 18.1. Neolithic settlement of Egolzwil 3 (LU): corded weave fragment, c. 4260 BC (After Wyss 1994).

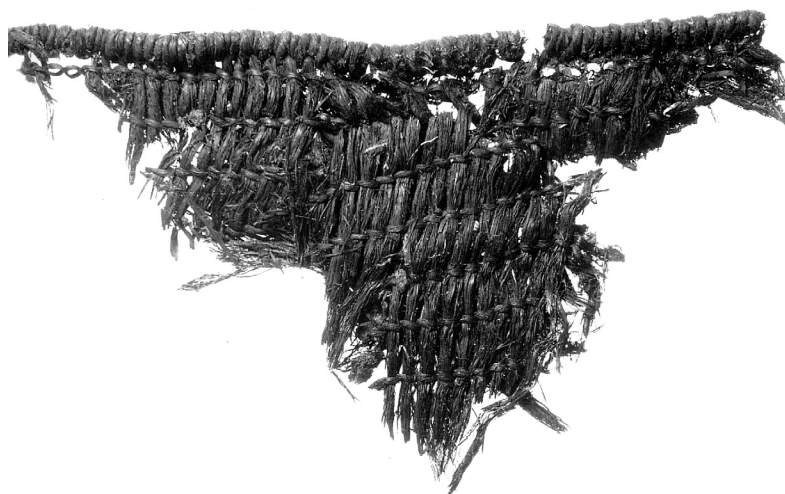


Fig.18.2. (opposite) *Pile dwelling of Mörigen (BE), photographed c. AD 1875 (After Keller 1876).*

sites, the textile remains come from the daily life context of the Neolithic communities of Switzerland. This situation provides us with a rare glimpse of the variety of textiles (as opposed to those chosen, for example, specifically for a funerary context) and to appreciate the diversity of production techniques.

Research History

The Circum-Alpine region which includes Switzerland, the north of Italy, the south of Germany and the east of France, has been a key area for textile finds since the 19th century. In particular, the excavations of lake dwelling sites have produced a significant quantity of organic remains mostly dating to the Neolithic period and the Late Bronze Age. The textile remains found in these cases were both abundant and remarkably well preserved and soon attracted attention due to their quality and technical complexity.

Already in the 18th century AD, fields of pile dwellings were identified under the waterlines of numerous lakes, and the antiquity and wealth of the archaeological remains in these areas did not escape the notice of enthusiasts at the time. However, it was not until the water level decreased sufficiently that pile dwelling research came into its own. In the second half of the 19th century, several previously submerged lake dwelling sites were exposed to the open air (Fig. 18.2). The pile dwellings of prehistoric villages emerged, accompanied by large amounts of materials that could simply be picked up off the ground. The newly found accessibility to these areas, previously protected by the water provoked a frenzy for acquiring artefacts relating to the lake dwellings, and large private collections were accumulated during this period. It was in this context that the first textile remains were collected. However, it was not until the discoveries made at the site of Wetzikon-Robenhausen (ZH) that the existence of prehistoric textiles was fully taken into consideration (Messikommer 1913).

Raw Materials

Only remains made of plant fibres have been found in the Neolithic lake settlements. For several decades, the materials were identified by simple macroscopic observation. This

process meant it was sometimes possible to allocate a 'plant group' to some well-preserved fibres, but the method remained imprecise. Over time, textile studies have demonstrated the existence of a close link between the choice of materials, the choice of techniques and the resulting products. Knowledge of the raw materials used is now a key area of study that helps us to understand textiles and the relationships which link human beings to their physical, social, economic and political environment.

The currently available results highlight two categories of fibres used in the Neolithic era: fibres from tree or shrub bark and those from plants with bast (Médard 2004). To date, the use of the following species has been documented: lime/linden tree (*Tilia* sp.), oak (*Quercus* sp.) and willow (*Salix* sp.) in the former group, and flax (*Linum usitatissimum* L.) in the latter. However, the ethnobotanical data, ancient written accounts, and later industrial and medical treatises document that, in the past, in similar plant environments to those found in the Neolithic period, various other species were used: viburnum (*Viburnum* L.), bramble (*Rubus* L.), honeysuckle (*Lonicera* L.), reed (*Phragmites australis*), birch (*Betula* sp.), pine (*Pinus sylvestris* L.), sedge (*Carex* sp.), and many others (Vétilart 1876; Mathieu 1897; Fournier 1947–48; Lieutaghi 1969).

Despite this large number of possible fibre sources available in the Neolithic period, we are currently obliged to consider only those species whose presence has been documented by the archaeological evidence. Of these, two species have been repeatedly identified on several sites: linden/lime and flax. There is therefore no doubt that these were used extensively for textile making during this period. The analysis of extant remains further demonstrates that the use of tree bast fibres was significantly more common than the use of flax and that there is a direct link between the material and the type of product produced. The tree bast fibres are primarily associated with twined textiles, whilst flax is mainly reserved for woven fabrics (Fig. 18.3; Médard 2006; 2010a).

While the use of colours is implicit in the textile, neither traces of dyes nor decoration obtained by utilising the natural colour differences have been documented amongst the Neolithic remains. Even if originally present, the colours have long disappeared resulting in

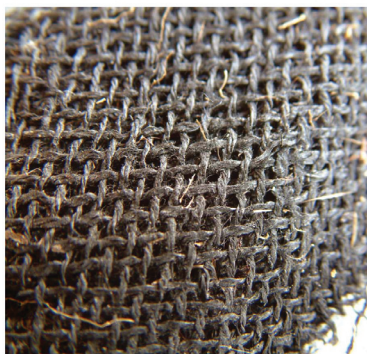
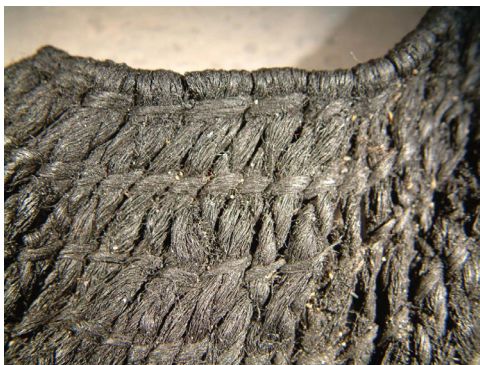
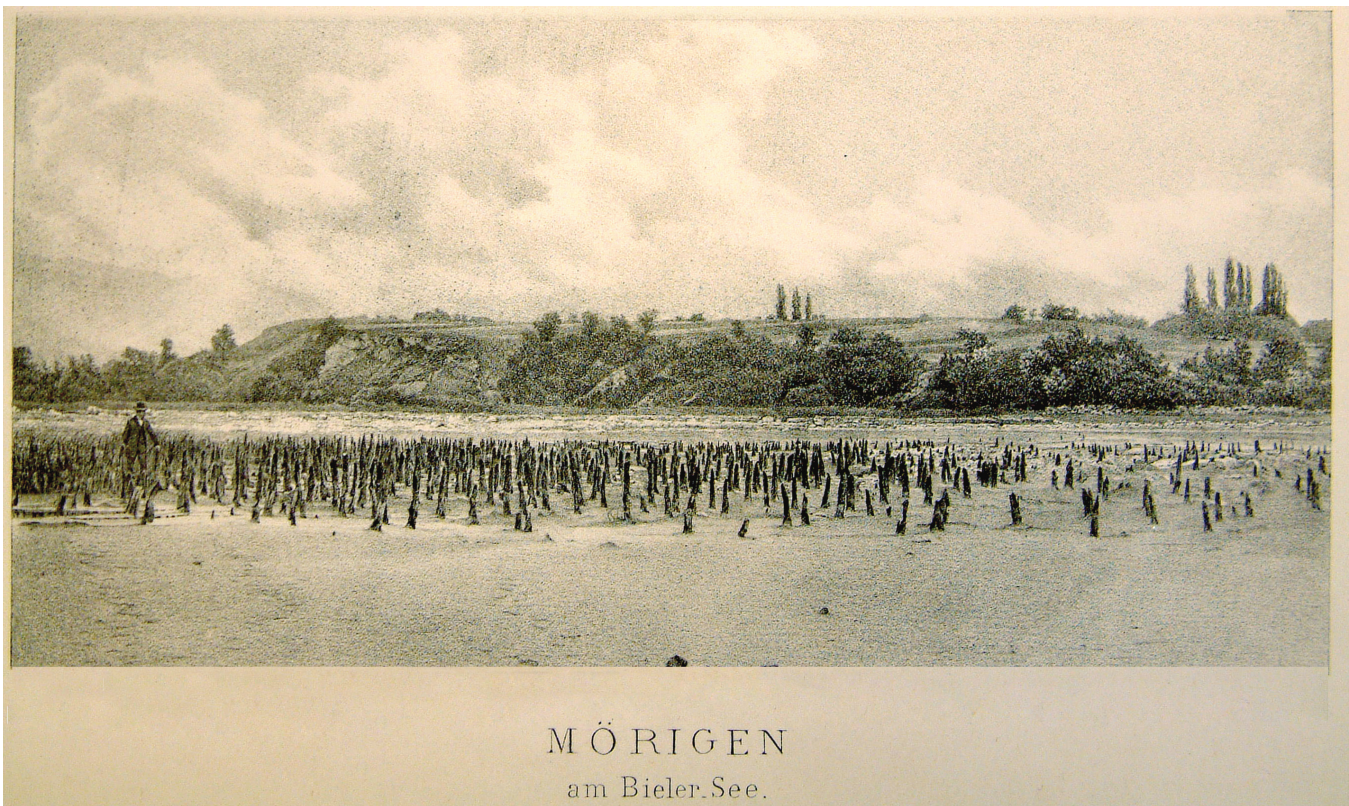


Fig. 18.3. Centre left: corded textile made of tree bast from the Neolithic settlement of Auvernier-Port (NE), Musée du Laténium, Neuchâtel. Bottom: woven textile made of linen from the Neolithic settlement Port-Stüdeli (BE), inv. no. 50828-2a, Bernisch Historisches Museum, Bern (Photo: F. Médard).



uniform colouring, which only partly reflects the original variety of Neolithic textiles.

Textile Tools

In addition to the large number of loom weights and spindle whorls, whose use in textile production is already well established, there is a range of morphologically ambiguous tools that have been associated, rightly or wrongly, with textile crafts. While various stages of textile

Fig. 18.4. Stone spindle whorls from the Neolithic settlement Delley-Portalban II (FR), Service Archéologique Cantonal, Fribourg (Photo: Service Archéologique Cantonal, Fribourg).

production involve a large number of very diverse tools, not all of the more enigmatic artefacts found on prehistoric sites should be associated with this activity. Neolithic textile crafts in fact used tools sparingly and more often than not the work was done by hand (Rast-Eicher and Thijsse 2001; Médard 2006; 2010a; 2010b). Therefore, only the tools whose use in textile production has been definitively demonstrated will be examined briefly.

Spindle whorls are beyond doubt the most common category of textile equipment on archaeological sites. It is not uncommon for one site to yield several hundred examples associated with one or more occupation levels. Among the sites with substantial numbers of spindle whorls are Arbon-Bleiche 3 (TG; Médard 2003; 2006), Delley-Portalban II (FR; Médard 2000; 2006); Eschenz, Insel-Werd (TG; Médard 2006); Meilen, Feldmeilen-Vorderfeld (ZH; Winiger 1981; Médard 2006); Meilen im Grund (ZH; Médard 2006); Zürich-Kleiner Hafner (ZH; Suter 1987); Zürich-Kan. San. (ZH; Gerber *et al.* 1994; Médard 2006); Estavayer-La Tenevière (NE); Lattrigen IV-Riedstation (BE; Médard 2006); Vinelz-Strandboden (BE; Médard 2006).

Some spindle whorls still contain a spindle shaft fragment inside the perforation leaving little doubt as to their function. The examination of production marks demonstrates that Neolithic spindle whorls, whether made of stone or terracotta, are primarily functional objects with no particular value or symbolic meaning. This is demonstrated by the modelling flaws, the uncorrected imperfections, and the varying regularity of the contours: the aim was not to produce a beautiful object but a functional one (Fig. 18.4). It is likely that while spinning activity may have been essential, it was not considered to be exceptional. The wide distribution of spindle whorls throughout settlement areas supports this observation, indicating that in the Neolithic period, spinning was a ubiquitous domestic activity, which could be carried out anywhere. Ethnological data provide some revealing parallels: more often than not spinning is not carried out in a specific place, nor by specialised craftspeople but as part of daily subsistence activities of most individuals (Médard 2006).

Loom weights are also common finds on Neolithic settlement sites, for example, at

Pfäffikon-Burg (ZH; Médard 2010a; 2010b), Sutz-Rütte (BE; Médard 2010a), Twann-Bahnhof (BE; Médard 2010), Auvernier-Port (NE; Schifferdecker 1982), Auvernier-La Saunerie (NE; Médard 2010a), Zürich-Kan. San. (ZH; Gerber *et al.* 1994), Zürich-Mozartstrasse (ZH; Gross 1992), Pfyn-Breitenloo (TG; Médard 2010a).

Although doubts have been expressed regarding the use of certain items, detailed examinations and statistical data prove they belong to the sphere of textile production. The shape typology and spatial distribution of the weights indicate their use as warp weights for vertical looms. Although several weaving techniques were used in the Neolithic period, the use of warp-weighted looms is suggested by the discovery of groups of loom weights on archaeological sites. Their distribution, the traces of wear from their attachment for suspension and sometimes the remains of cords or suspension rings found inside the perforations indicate the location of weaving equipment.

Neolithic loom weights are usually crudely made in poor quality clay, and are generally unfired (Fig. 18.5). They are fragile, breakable and not made to last long. This is however compensated for by the speed of their production; they were probably produced as and when they were needed (Médard 2000; 2010a).

Textiles

The Neolithic textile materials include the remains of ropes, cords, balls of threads, skeins, fabrics and supple, semi-rigid or rigid wickerwork (Fig. 18.6). This chapter focuses on textile production represented in the Neolithic by two techniques: twined and woven fabrics. Twined weave is formed by twisting two or more active threads around one or more passive or active threads (Fig. 18.7). This process allows for a large number of variations in terms of the density of the two systems (passive and active), the organisation of the threads involved and the direction of the twined thread (s or z-twist), as well as their position in the textile. These technical systems can be implemented manually without using any tools or frames, and may be worked in parallel, or diagonally, to the edges of the textile (Seiler-Baldinger and Médard in press).

The most notable difference between twining and weaving is that, in the latter, the sheds are opened automatically, *i.e.* by separating the alternating warp threads into two sets using a shed rod (first shed) and heddles (second shed). Due to the heddlng system, production time is significantly reduced but preparation time (warping) is longer. A large variety of weaving devices make it possible to obtain almost identical weaves. The principle shared by all these systems is that the warp threads are held taut, divided into two or more sets, between which the weft threads are inserted. There are several solutions for keeping the warp threads under tension, including the use of horizontal, vertical or body tension looms.

Although the woven textiles are those most commonly discussed in publications, the proportion of twined textile remains is much higher on Neolithic sites. The twining technique occupies a key position in textile production in this period.

The borders (starting, end or selvages) of the Neolithic textiles are usually produced in a different technique to the main body of the fabric. The borders stand out either by a change in the number of warp or weft threads, the use of a different weave, or the change in the sequence in which the threads enter the edges. Some are easily identifiable as starting borders whilst others could also be selvages. Starting borders are produced in a variety of ways: the simplest involves following the pattern of alternate warp threads being taken up, either one at a time, two at a time or three at a time, and then reversing the threads taken up and left off on the next row (Fig. 18.8).

There are however examples of more complex systems. For example, at Wetzikon-Robenhausen (ZH), the warp threads of the starting border follow the pattern of six threads taken up, two left off, with the sequence reversed in the following row, *i.e.* six left off, two taken up (Fig. 18.9; Vogt 1937, Abb. 97, 98, 99; Schwab 1961, 350). This type of border produces a ribbed effect, resulting from the extra tension in one out of every two weft threads. This kind of border would have been produced separately and before the weaving of the fabric began (Fig. 18.10; see Hoffmann 1964, 64–67, 83–85). The starting borders produced in this manner are regular, solid, dense and sometimes decorated.

The transition between the starting border

and the weave itself is often handled with great care and marked in some way. It is rare that the transition is only marked by a change in the density of the weft threads, usually the warp threads are also distributed differently according to a variety of patterns. One method, for example, involves crossing the warp threads under the starting edge in the nexus between the starting border and the ground weave (Fig. 18.11). This redistribution of the warp threads seems to be entirely the weaver's choice, and there is no evidence to indicate any standardisation. Neolithic craftspeople did not hesitate to change the structure of the fabric while working and to modify or manipulate it manually, despite the increased automation offered by heddlng.

Selvages are relatively common in Neolithic textiles, although they are often very narrow. Although functionally different, starting and side borders cannot always be differentiated if there are no other indicators of the way in which the fabric was produced. Amongst the selvages which have been clearly identified, two types of construction are attested to. The first method involves weaving a simple tabby edge, which stands out from the rest of the fabric by the reduction of the warp threads and in some cases, by simultaneously working several warp threads. The second method involves weaving an extended tabby rib border (one warp thread taken up and one left off every two picks), which stands out from the rest of the fabric due to the reduction in warp threads and the change in weave caused by the new distribution of the warp threads (Fig. 18.12).

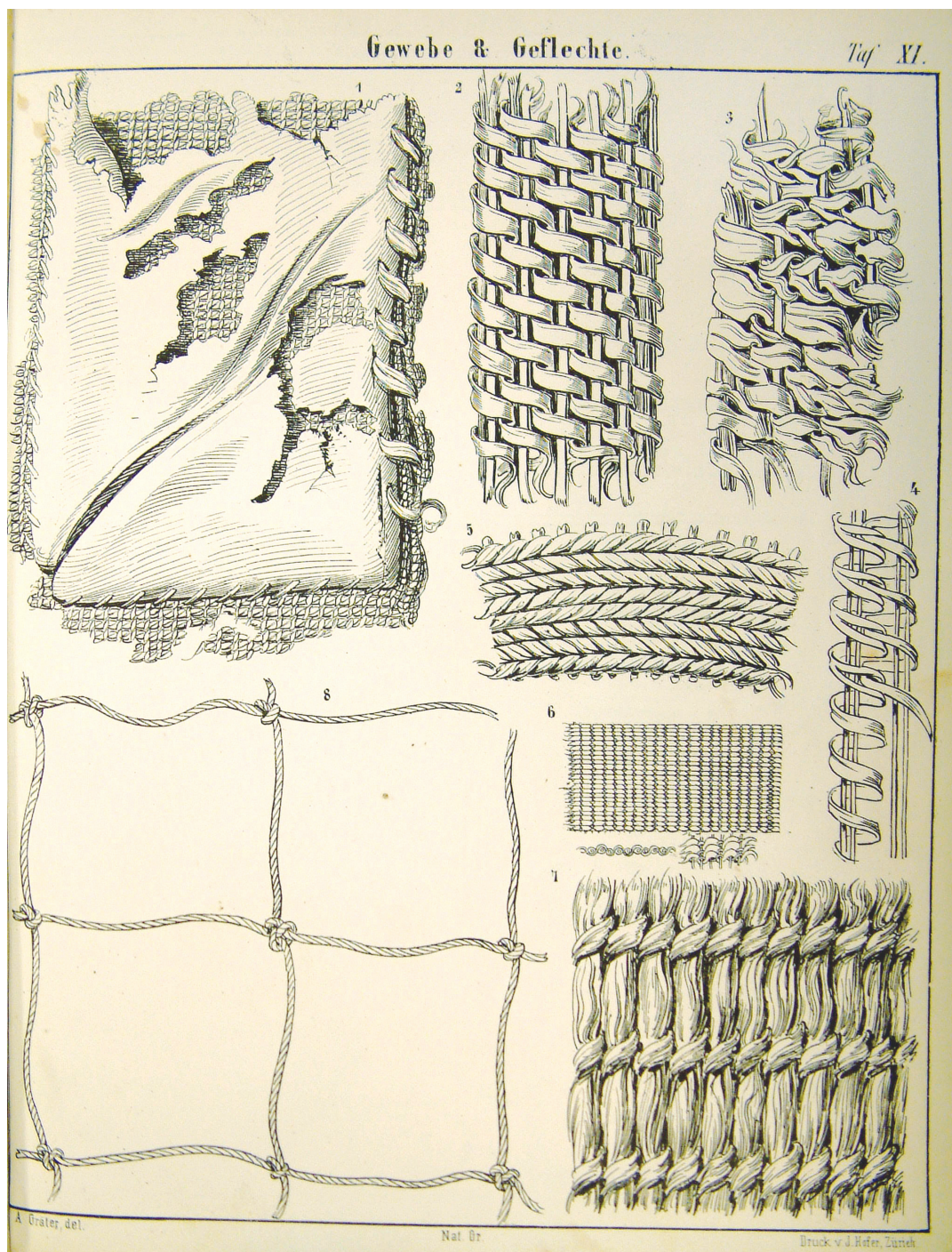
The side borders, woven in tabby present no technical difficulties: the warp threads are threaded in the same way for the fabric and the border. However, this configuration is uncommon in the Neolithic period. When side borders are woven in tabby, they are often finished with several warp threads taken up together. Although this is not complicated to achieve, it does require that the threads which work together are threaded in a specific manner. The method of threading every other warp thread in the heddles (to create a plain weave) does not seem to have been systematically used through to the edges of the woven fabric, despite using the same technique for both the border and the fabric. It is also possible that the warp threads positioned between the

Fig. 18.5. Terracotta loom weights, probably accidentally fired, from the Neolithic settlement Pfyn-Breitenloo (TG), Amt für Archäologie, Thurgau (Photo: Amt für Archäologie, Thurgau).



border and the fabric are manually taken up at each pick, for reasons of convenience. This may also have been the case for the border threads, unless the heddle bar was manoeuvred in a specific manner when weaving borders. As the side borders of Neolithic textiles rarely constitute more than twelve warp threads, it

Fig. 18.6. Nineteenth-century illustration of some early discovered textiles (After Keller 1863).



is possible that weavers at this time chose not to make the heddles simply to produce such a small piece of fabric. In addition to the technical information they provide, our observations of these types of borders suggest that Neolithic craftspeople sought to make them perfectly straight, parallel, solid and aesthetically pleasing. Like the starting borders, they were made to meet very high standards (Fig. 18.13).

Finishing borders are rare but those that have been preserved demonstrate a certain complexity. None of them are simple nor are they alike: there appear to be no standard rules for finishing fabric edges. Perhaps the finishing of a textile was made according to individual preferences and the know-how of the weaver. The simplest type of finishing border consists of fringes made directly from the warp threads, fixed at regular intervals by knots. A piece of fabric found at Twann-Bahnhof (BE) has this type of finishing: the warp threads are grouped in threes and each group is fixed with a simple knot. The textile is woven by manoeuvring the heddles right up to the last weft row, the row of knots is then made manually. Experiments

demonstrate that it is easier to keep the warp threads stretched during this stage of the process: the fabric is held in place and the knots can be tied and distributed more regularly (Fig. 18.14).

A more complex finishing border was observed on a textile fragment found at Schafis (BE) (Vogt 1937, 55–57, Abb. 90, 91, 92; Schwab 1961, 349, Abb.). The warp threads here were grouped in pairs and tied using a series of simple looped binding of half-hitch knots. Weaving then recommences under the row of knots, using a half-basket weave. The weft threads pass alternately under and over two warp threads and are tightly beaten up, thereby entirely covering the warp. Several

Fig. 18.7. (top)
Construction of twined
weave (Drawing: F.
Médard, after Seiler-
Baldinger 1991).

Fig. 18.8. (centre)
Left: schematic drawing
of a weave in tabby.
Right: experimental
reconstruction of a
starting border in tabby
(Drawing, experimental
reconstruction and photo:
F. Médard).

Fig. 18.9. (bottom)
Left: schematic drawing
of a starting border
woven in a dominant
weft-ribbed weave. Right:
starting border of the
original fabric from
Wetzikon-Robenhausen
(ZU), inv. no. 32587,
Monuments Historiques
et Archéologie Suisse,
Lausanne, Vaud
(Drawing and photo:
F. Médard).

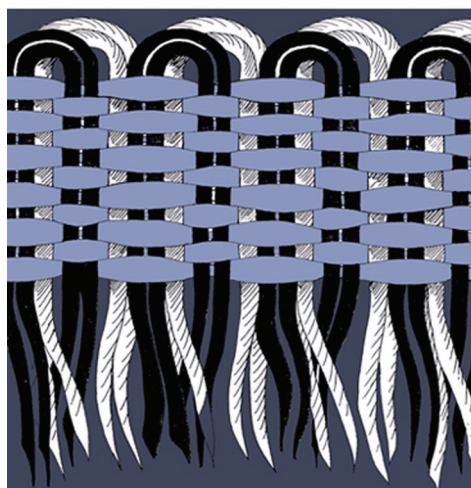
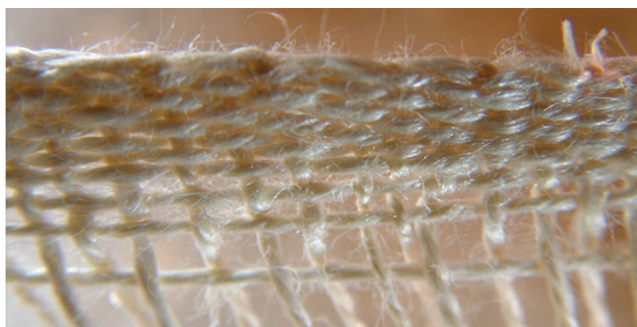
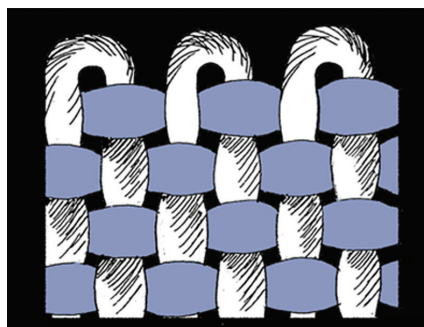
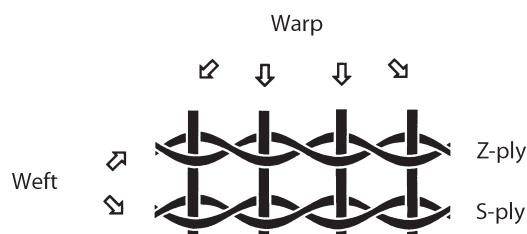


Fig. 18.10. Left: schematic drawing of the method used to weave the starting border observed on Neolithic textiles (After Hoffmann 1964). Right: experimental reconstruction of a starting border woven according to this method (experimental reconstruction: D. Mathieu, Association La Couenne; photo: F. Médard).

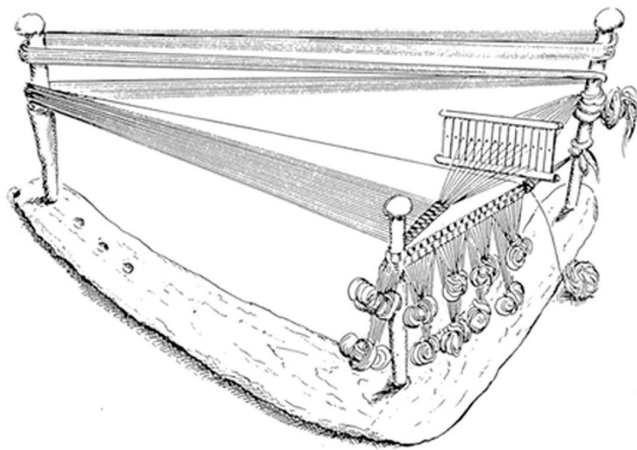


Fig. 18.11. Left: warp threads crossed two by two at the end of the starting border. Right: starting border made with 4 warp threads, the first crossed with the third and the second with the fourth (Drawing: F. Médard, after Vogt 1937).

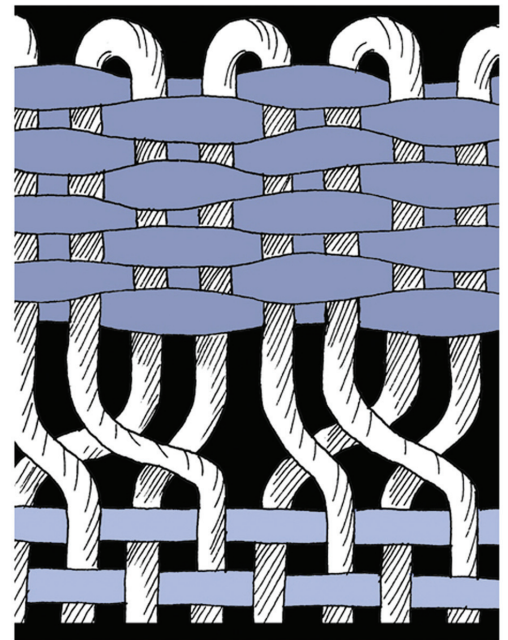
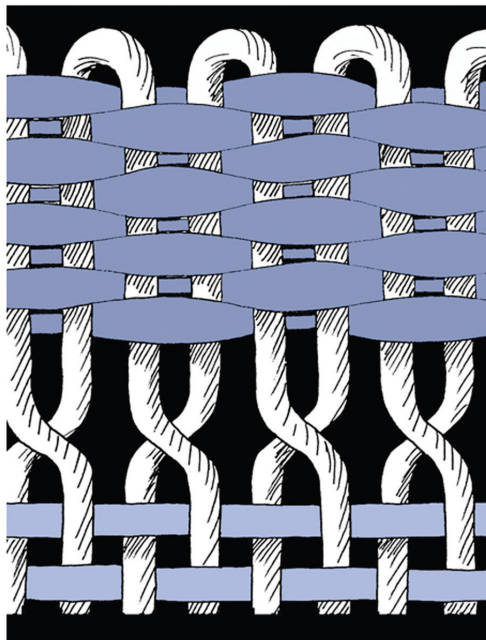
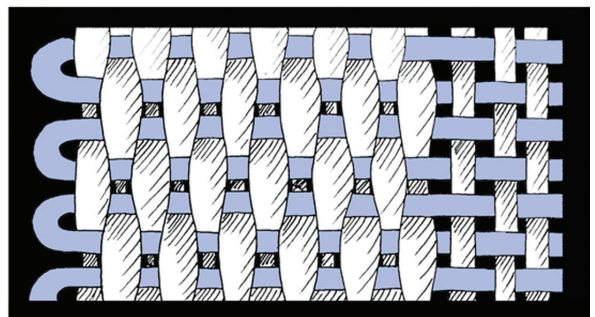
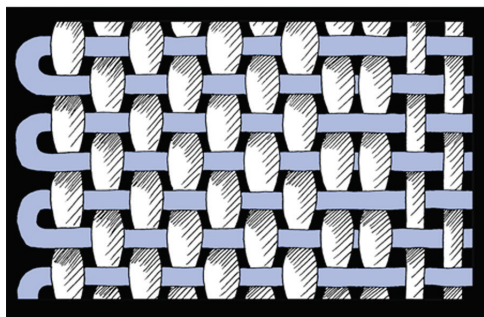


Fig. 18.12. Left: selvedge in west-faced tabby. Right: selvedge in rep weave with two dominant warps (Drawing: F. Médard).



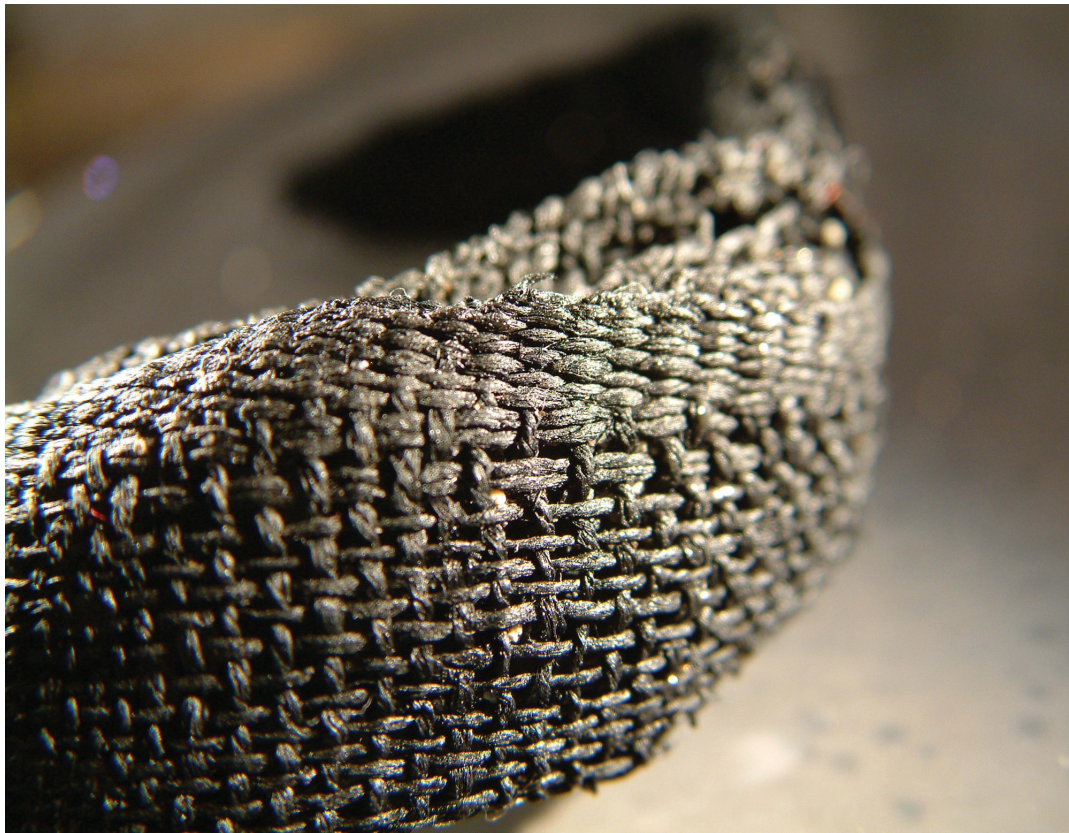


Fig. 18.13. (left) Side border of a textile from the Neolithic settlement Auvernier-Port (NE), inv. no. 1700, Musée du Laténium, Neuchâtel (Photo: F. Médard).

Fig. 18.14. (below) Finishing border of a textile from the Neolithic settlement Twann-Bahnhof (BE), inv. no. 691, Archäologischer Dienst, Bern (Photo: Archäologischer Dienst, Bern; drawing, experimental reconstruction and photo: F. Médard).

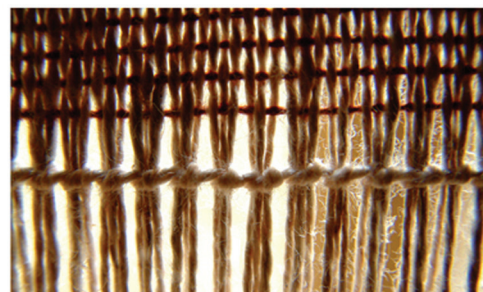
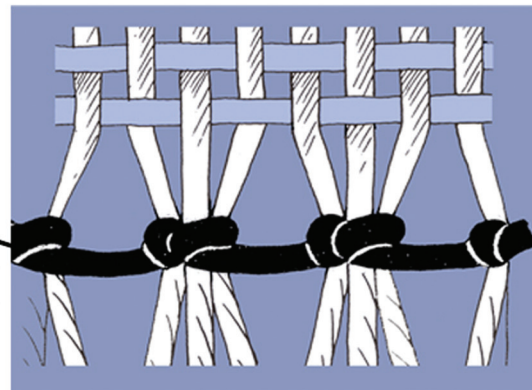
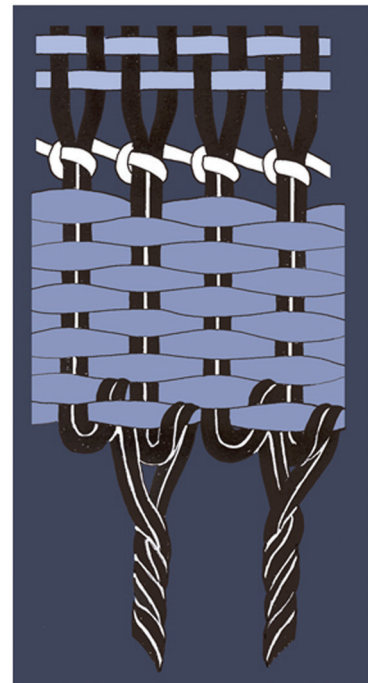
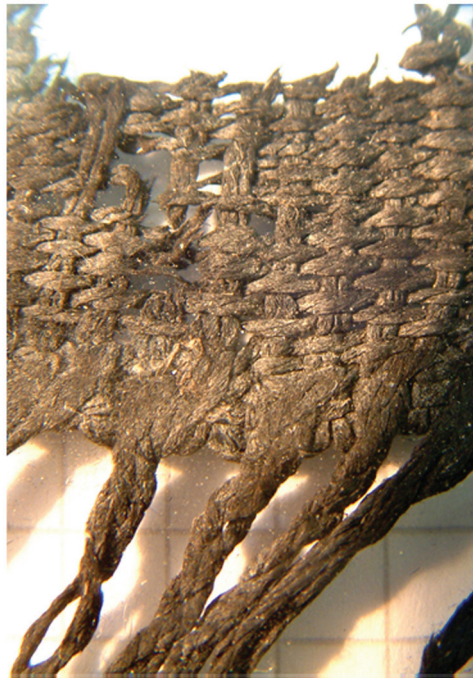


Fig. 18.15. Finishing border of a textile from the Neolithic settlement Schafis (BE), inv. no. 2731, Bernisch Historisches Museum, Bern (Photo: F. Médard; drawing: F. Médard after Vogt 1937).



picks are woven in this manner before the warp threads are looped into the weave to block the final weft threads and cabled using s or z-twists (Fig. 18.15). The warp threads were not redistributed in the heddles in the section below the row of half-hitch knots. Either they remained under tension and then were selected by hand or they were detached from the weights. In this case, the ten weft threads would have to be held horizontally. We can imagine this being done using a small hook or needle, which would be also used to loop the warp threads into the border having left them hanging freely at the end of the piece of fabric (see Fig. 18.15).

Although there are very few examples of finishing borders, they demonstrate that their production was both complex and required high levels of skill and attention. As in the case of the starting borders, finishing borders are often created independently, after the ground weave has been completed. The strength and aesthetics of the textile play a key role in the production process.

Conclusions

We do not know exactly when looms were first used in western Europe. Generally this

development is placed in the Neolithic period based on the extant archaeological finds. Nevertheless, we cannot exclude an even earlier origin for this technology (Cheynier 1965; Adovasio *et al.* 1996; Soffer *et al.* 1996). However, whenever the loom first came into use, it undoubtedly marked a clear break with earlier, fully manual techniques. The system of heddles introduced a form of automation, which allowed weavers to produce more fabric in less time.

Despite this, the analysis of borders from the Swiss Neolithic textiles demonstrates that weavers were not trying to work more efficiently or in a more standardised manner. By working manually on the fabrics, they only partially exploited the potential of the weaving loom.

Textile production in the Neolithic period seems to fall between two working systems, one entirely manual and the other semi-automated. This should not, however, be interpreted as a sign of backwardness. Although the potential of the loom may not have been fully exploited, this was probably not due to a lack of understanding of the technical system but rather due to the existing social, economic and cultural environment and their specific constraints and needs.

Note

- 1 Abbreviations in brackets refer to the Swiss cantons: BE – Bern, FR – Fribourg, LU – Lucerne, NE – Neuchâtel, TG – Thurgau, TI – Ticino, VD – Vaud, VS – Valais, ZH – Zürich.

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Switzerland: Bronze and Iron Ages

Antoinette Rast-Eicher

Introduction

The preservation of Bronze and Iron Age textiles in Switzerland differs greatly: Bronze Age material has survived in lake dwellings, while Iron Age textiles are known mainly from graves where they have been preserved in connection with metal finds. In the former case, textiles are often carbonised and are made of plant fibres; in the latter case, textiles of different materials as well as skins survive.

Chronological and Cultural Background

In prehistoric times, Switzerland was always subject to different cultural influences coming interchangeably from the western part of Europe (Rhône Valley in France), from the East (Danube region) and from the southern and Mediterranean regions. The Alps have continuously served as both a cultural barrier and a link between different cultures, providing important trade route passages over high passes. Another line runs south from Basel and divides east and west – today a language boundary line between the German and French parts of the country.

Pre-ceramic Neolithic cultures have been

identified by pollen analyses: there are cereals, domesticated animals but no ceramics. The first Neolithic settlements appear in the mid-6th millennium BC in southern Switzerland, Bellinzona Castel-Grande (TI)¹ and Sion-Planta (VS), followed by the Linear Pottery (*Bandkeramik*) culture of northern Switzerland dated to the second half of the 6th millennium BC. They represent the earliest remains of the first farmers. The Neolithic lake dwellings document a long time span from 4300 BC to 2400 BC, with about 450 sites on the Swiss lakes recorded to date. These are generally well-dated by dendrochronology and radiocarbon (Hafner and Suter 2003; Stöckli 2009).

The earlier cultures are more regional, including the Cortaillod culture in the west, *e.g.* at Twann (BE), the Pfyn culture in the east, *e.g.* Pfyn-Breitenloo (TG) and Meilen Schellen (ZH), and the Egolzwil culture in central Switzerland at Egolzwil III (LU). The Horgen culture at *e.g.* Horgen-Scheller (ZH), and later the Corded Ware culture at Zurich-Mozartstrasse (ZH) and Auvernier-La Saunerie (NE) unify the central European cultures. The Beaker culture is rarely found at the lake dwellings but is well represented in the Valais region and continues into Early Bronze Age layers, *e.g.* Sion-Petit Chasseur (VS). The waterlogging in the lakes

resulted in a substantial amount of extant botanical and archaeozoological materials which together with ceramic and stone objects enable a detailed reconstruction of human activity during these periods (Schibler *et al.* 1997).

The cultural units during the Bronze Age continue to be relatively small in scale. The Swiss Bronze Age chronology is based on Reinecke's system Bz A to D (*cf.* Möller-Wiering in this volume), followed by Hallstatt A (Ha A) and Hallstatt B (Ha B) belonging to the Late Bronze Age as well. The Late Bronze Age is the term used here for the period Bz D to Ha B3, which corresponds to the Urnfield culture (*cf.* Grömer in this volume). The absolute chronology places the Early Bronze Age about 2200–1700 BC, the Middle Bronze Age 1500–1350 BC, and the late Bronze Age 1350–800 BC. The onset of the Early Bronze Age, the time between the Neolithic Beaker culture and the beginning of the tumulus graves of the Middle Bronze Age, is associated with graves in the western part of Switzerland, as for example at Sion Petit Chasseur (VS) and Spiez-Einigen (BE), and on settlements in the east, *e.g.* Arbon-Bleiche 2 (TG). By 1800 BC, solid cast bronze objects appear. Bronze Age layers are documented in lake dwellings as well, leaving a time span of 1500 to 1100 BC without data due to changes in the water level, but a continuation of Late Bronze Age settlements is seen at the lakes up to *c.* 850 BC (Greifensee-Böschen ZH). In the Alps, there are local cultural developments, *e.g.* at Savognin-Padnal (GR), demonstrating connections and trade between the Alpine regions. Bronze pins found recently on a glacier south of Sion (Schnidejoch) once more confirm long-distance connections over high Alpine routes during mild climate periods in the Early Bronze Age (Suter *et al.* 2006).

In contrast to the chronology of the Neolithic period and the Bronze Age, where dendrochronological and radiocarbon dates provide a solid framework, the dating of the Swiss Iron Age is based on the relative chronology of metal finds – especially the fibulae – recovered from inhumation burials. The Iron Age is subdivided into Hallstatt C, Hallstatt D and the La Tène period (Müller *et al.* 1999; also see Grömer this volume). The Iron Age begins after the final Late Bronze Age settlements dated by dendochronology

shortly before 800 BC (*e.g.* Uerschhausen-Horn (TG), late Ha B3).

There are only few closed archaeological contexts with absolute dates: the shield from Marin-Eparnier belongs typologically to Lt C1 and is dated by dendrochronology to 229 BC; the palisade from Yverdon-les-Bains (VD) belonging to Lt C2 is dated to 161/160 BC and 159/158 BC; and the bridge in Geneva (GE) was built in 123 BC. The absolute chronology of the Hallstatt period is primarily based on sites in Germany, Austria and Italy, *e.g.* dendrochronological dates of the Magdalenenberg in Villingen, 621 BC, which marks the transition from Ha C to Ha D1 (*cf.* relevant articles in this volume). Cross-dating with the Mediterranean cultures provides further dates for the following La Tène period (Stöckli 1975). Nevertheless, La Tène phases are primarily defined by typological criteria of the metal finds, especially the fibulae. Local forms belong to the Alpine regions and southern Switzerland.

Many Swiss Iron Age textile finds come from old excavations; new finds, especially those dating to the Hallstatt period are quite rare. The finds from the Hallstatt period belong to elite cremation graves and are very rich. Later, during the La Tène period, more people were inhumed with grave goods, especially in southern Switzerland where large graveyards have been found. These are dated to the phases “Tessin A” and “Tessin B” related to the Golasecca and the La Tène cultures, *e.g.* Giubiasco (TI), Arbedo (TI), and Solduno (TI). Early Celtic inscriptions written in an archaic Etruscan alphabet found in the Locarnese are the earliest written documents found in Switzerland, dating to the 4th–5th centuries BC. Late La Tène settlements (*oppida*) such as Basel-Münsterhügel mark the last Iron Age occupations before the Roman invasion in 16/15 BC.

Research History

In Switzerland, the Bronze Age textiles provide a small corpus of pile dwelling finds, which chronologically follow the much larger quantity of Neolithic basketry and textiles published and discussed in several recent books and articles (*e.g.* Bazzanella *et al.* 2003 with further bibliographies; Rast-Eicher and Dietrich in press; *cf.* Médard in this volume). This research

started in Switzerland with the discovery of the pile dwellings in the Alpine lakes in 1854. In particular, the site of Wetzikon-Robenhausen (ZH), the famous site near Zurich, discovered by Jakob Messikommer, became internationally known after the works of Ferdinand Keller and Heinrich Messikommer published between 1861 and 1913 (Altorfer 2010). Already in the mid-19th century, based on the discussion which had taken place a few years earlier about the 'Worsae web', Ferdinand Keller proposed that these Neolithic textiles were produced on a warp-weighted loom (Keller 1861, 20–23).

In 1937, Emil Vogt published his *Gewebe und Geflechte der Steinzeit*, in which he analysed and discussed the 19th-century finds (Vogt 1937). This book was for many years the principal reference for the textiles found in Swiss lake dwellings. Based on radiocarbon dating of a textile and a new study of the archaeological objects, it is now known that most of the material from Wetzikon-Robenhausen belongs to the Pfyn culture (Altorfer 2010).

New sites have been excavated since the 1970s, many of them under water. Numerous new finds provide a firm basis for the understanding of techniques used in the Neolithic period. Recent studies have dealt with the technical aspects and chronological developments of spinning and weaving techniques in these early settlements (Rast-Eicher 2005; Rast-Eicher and Dietrich in press). Further analyses, especially on spinning techniques, form the subject of recent publications (Médard 2006; Leuzinger and Rast-Eicher 2011). Furthermore, Neolithic and Bronze Age textile and leather garments found in glaciers provided a more complete view on prehistoric garments (Hafner and Suter 2003; Hafner in press).

Some of the Iron Age textile finds from graves (*e.g.* Subingen SO) were analysed by Hans-Jürgen Hundt in Mainz (1983). With a few exceptions, the La Tène material was not studied until recently. Lise Bender Jørgensen (1992) catalogued the textiles from the National Museum in Zürich, and Katharina von Kurzinski (1996) compiled a catalogue of published material. Johanna Banck-Burgess (1999) discussed the old finds in her overview. In a recent work by the present author, all extant Iron Age textiles were catalogued and analysed (Rast-Eicher 2008a). An important part of this catalogue is the newly excavated

material. Scanning electron microscopy made textile analysis of the mostly mineralised textiles possible. A few examples from this research have been chosen to illustrate the development of textile technology in Switzerland during the Bronze and Iron Ages.

Neolithic

The textiles from the Neolithic pile dwellings are all made of linen or bast fibre, and they all have plied yarns (*e.g.* Twann BE; Feldmeilen-Vorderfeld; Zürich-Mozartstrasse ZH). Some selvages are reinforced, others are simple. The amount of such textiles is extraordinary: in the lakes of the canton of Zürich alone, 31 sites with textile fragments were discovered. These total more than 1000 objects (textiles and basketry) that were recovered in Neolithic or Bronze Age layers, a vast majority of them being Neolithic (Rast-Eicher and Dietrich in press).

At least some fragments of woven textiles can be identified as parts of garments, for instance, pockets, a buttonhole and very fine striped textiles, with stripes made using triple-plied yarn (Rast-Eicher 2005; Rast-Eicher and Dietrich in press). Although there is evidence of textiles used for clothing, leather and skins must have been the predominant materials for cold weather wear, as attested by the 'Iceman' of Oetzthal, Italy (*cf.* Bazzanella this volume), and the recent find of the Schnidejoch (BE) (Suter *et al.* 2006; Hafner in press). The Schnidejoch find consists of shoes, skin trousers and a cape, as well as a bow, arrows and a sort of bag made of birch bark to put them in. The body with which they were likely associated is missing. Both the Iceman and the 'Schnidi' wore skin/leather trousers and travelled over high passes of 3000 m altitude. More information on the Neolithic textiles of Switzerland is presented by Fabienne Médard in this volume.

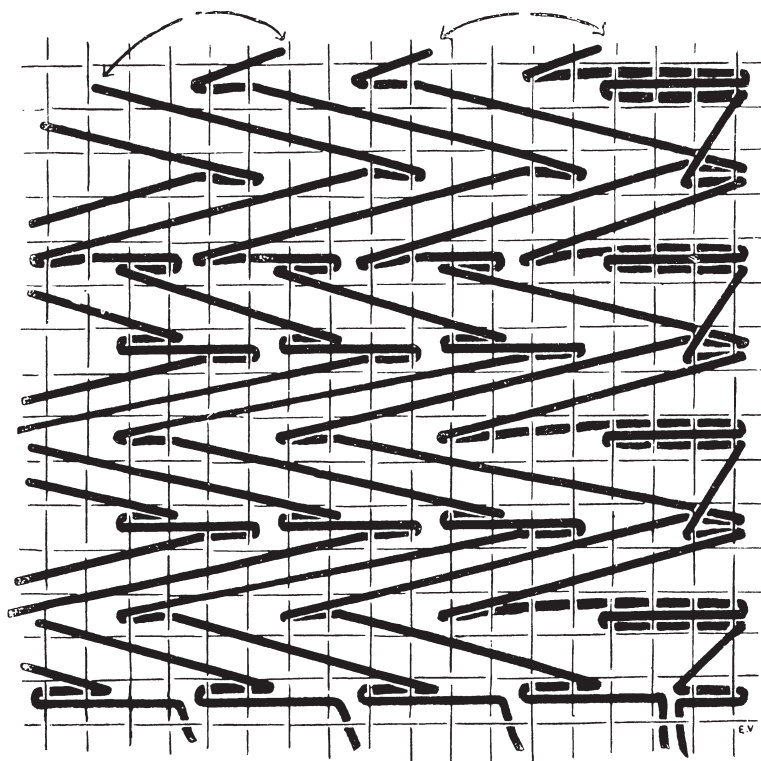
Bronze Age

Unfortunately, Bronze Age layers in lake dwellings present less optimal conditions for the preservation of organic remains than those from the Neolithic period. This is due to the fact that the Bronze Age material is found in the top layers and the organic material was easily washed away or mixed with later deposits. Even in thick settlement layers, textiles

seldom survive. The well-known and prevalent techniques of the Neolithic period such as coiling and twining are rare (only twining was observed in sieves). The few pieces found are woven textiles, while there are many examples of basketry. However, the main reason why textiles in larger quantities are scarce in both eastern and western Switzerland is the shift to another fibre, namely wool. The layers in the lake dwellings are alkaline, and therefore are not conducive to the preservation of animal fibres or leather. The preference for and change to this new fibre material is also evident in the tool assemblages and the increased number of sheep bones in the finds.

Only a few woven textiles from the Bronze Age have been found in Switzerland. The famous textile from Irgendhausen (ZH) is a single linen textile find from the site. During the 19th century, the settlement layers slid into the lake of Greifensee and made further excavations impossible. Emil Vogt published the piece as belonging to the Neolithic period (Vogt 1937), but a radiocarbon dating placed it in the Bronze Age (1685–1493 BC cal; Rast-Eicher and Reinhard 1997). A recent analysis of the large fragment in the National Museum of Zurich has yielded new information: the linen textile is woven in tabby and then embroidered with a linen thread (Fig. 19.1). Previous analysis suggested that it was patterned during weaving using floating threads (*fliegender Faden*; cf. Grömer in this volume). However, as some of the threads had been pierced, this is a clear indication of the use of embroidery (Rast-Eicher and Dietrich in press).

The Bronze Age finds from Greifensee-Böschen (ZH) are dated to the Late Bronze Age (dendrochronological dates around 850 BC; Eberschweiler *et al.* 2007). Sixteen tabby fragments are preserved in total, with a maximum size of 4 × 7 cm, all woven with S2z-plied yarns (diameter 0.8–1 mm, 7 threads/cm; Fig. 19.2). Compared to the Neolithic linen textiles, the threads are smoother and lighter and an examination of the fibres revealed that they are more carefully processed. The flax fibres are all separated from each other and do not show parallel nodes and fibre bundles as in the earlier period. Since the preservation conditions were the same, this did not happen by chance but rather indicates that the processing of flax appears to have changed. Neolithic textiles are woven with plied thread



made of two spliced yarns. In the Bronze Age, the processing of fibre changed, and perhaps included combing and spinning, instead of splicing the fibres (Fig. 19.3; Rast-Eicher and Leuzinger 2010).

Sheepskin has been found lately in a Bronze Age grave from Spiez-Einigen (BE). It was mineralised on the back of an ornament at the back of the head. As the fibres were facing downwards – away from the body – this skin

Fig. 19.1. Irgendhausen (ZH): patterned textile (After Vogt 1937, fig. 138).

Fig. 19.2. Greifensee-Böschen (ZH): textile (FK 2105), Late Bronze Age (Photo: Kantonsarchäologie Zürich, M. Bachmann).

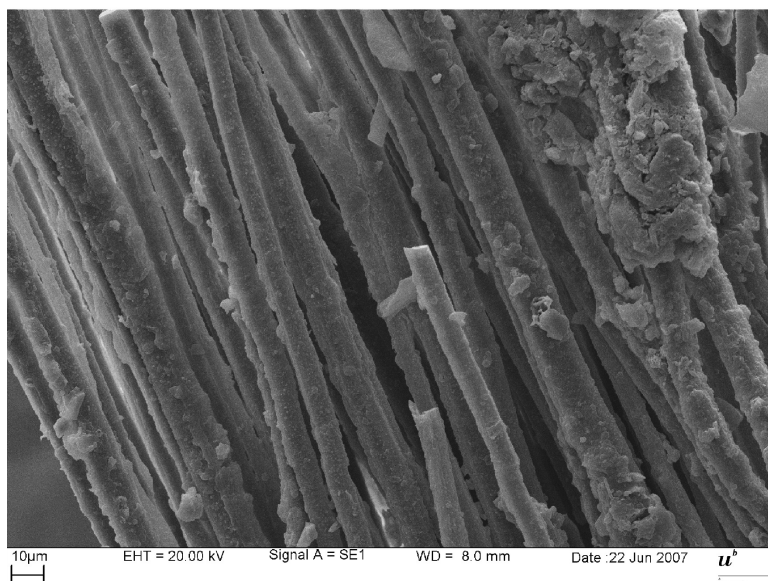
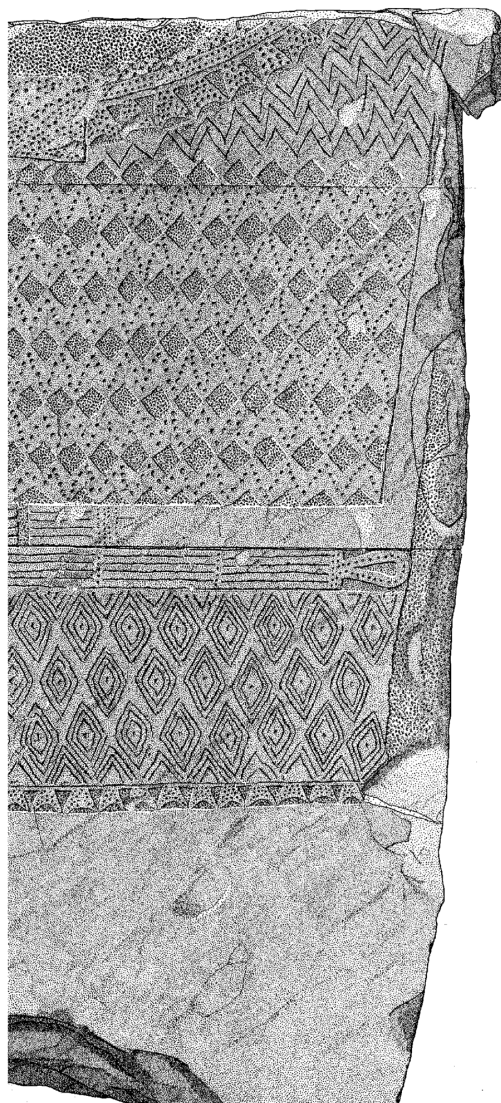


Fig. 19.3. Greifensee-Böschel (ZH): linen fibres from textile FK 2105 (Photo: A. Rast-Eicher).

Fig. 19.4. Sion-Petit Chasseur (VS): Late Neolithic stele (Drawing: S. Favre, Département d'Anthropologie, Université de Genève).



was probably used as a garment (with hood?) and not as the lining of the coffin. No fibres could be detected on the large bronze pins (Cooper *et al.* 2010).

With so few items available, it is difficult to discuss the costume of the period. We do, however, have finds which provide some data on the dress. Large engraved anthropomorphic stone grave stelae from Sion, Petit Chasseur (VS), dated to the Late Neolithic (2500–2300 BC), sometimes include elements of dress. On one of these stelae, a human figure is depicted wearing a garment with a lozenge pattern and a girdle at the waist (Fig. 19.4). The girdle is shown with a large loop at one end. Actual examples of a girdle with a loop and a textile with a lozenge pattern are known from the Early Bronze Age contexts in north Italy, in the settlement of the Lago di Ledro, Trento (*cf.* Bazzanella in this volume).

Another relevant find comes from an Early Bronze Age grave at Sion, Petit-Chasseur (VS), where small bronze tubes placed in the front and at the back of the body indicate that originally there had been a border or a reinforcement of a textile (Fig. 19.5; Gally 1986). A similar bronze tube with a wool thread inside has been found in Hauterive-Champréveyres (NE). This is so far the only wool thread known from the Swiss Bronze Age (Rast-Eicher and Reinhard 1997, Fig. 153), apart from a mineralised textile on a Late Bronze Age sickle from Zürich-Alpenquai (ZH). The fibres are in very bad condition, but fibre shape and diameters clearly suggest they are animal fibres, probably sheep wool.

The long dress pins popular at this time are usually linked to wool rather than to linen textiles, since they would cause damage to the less flexible linen fabric. More likely, round buttons with two holes would have been used for linen garments. Such items have been found in the Neolithic layers and are crafted of antler or shell. Possible proof for the use of buttons is provided by the late Neolithic textile fragment from Zürich which incorporates a buttonhole (Rast-Eicher 2005, Figs 17–18). This button type has not been found in the Bronze Age, and recurs only much later in the Medieval period. Convex metal buttons with one eye have been found from the Late Bronze Age and the Hallstatt period. According to finds in Germany, they were probably decorations for shoes (Lage 1999, 43–44).

Spindle whorls appear in different shapes in

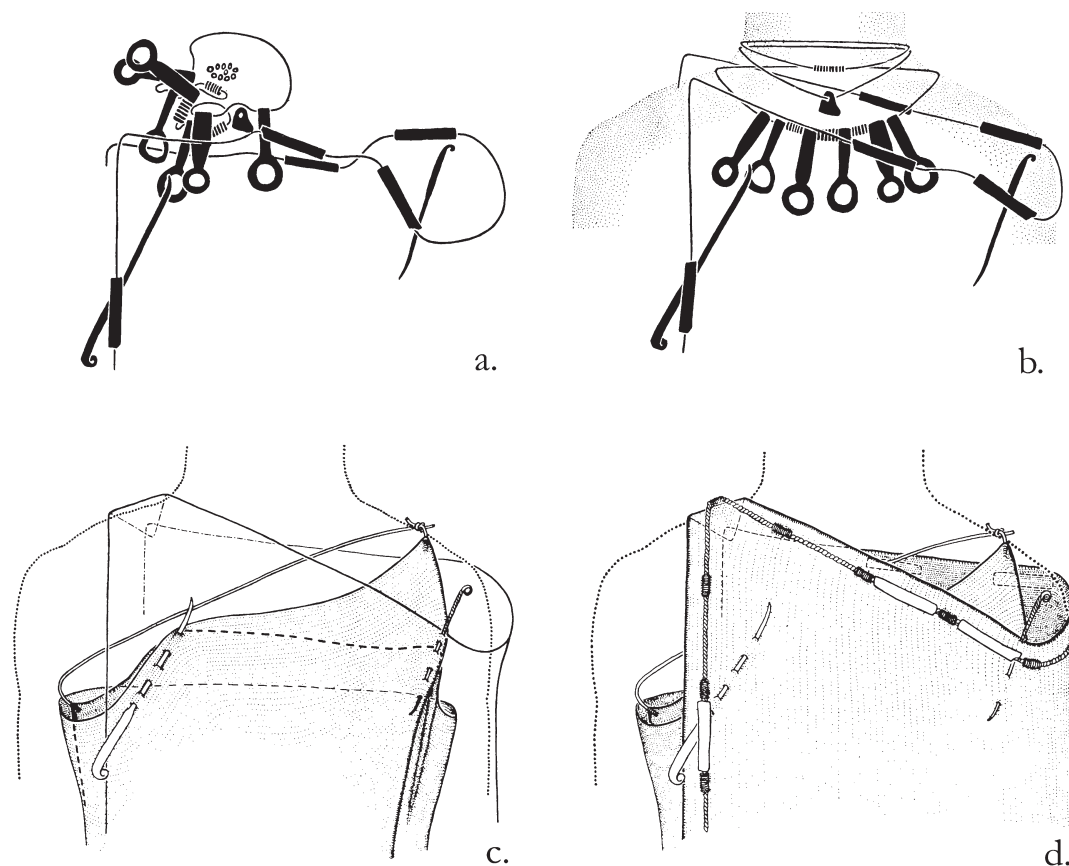


Fig. 19.5. Sion, Petit-Chasseur grave 3, Early Bronze Age: a) Objects in situ; b) Localisation on the body; c–d) Reconstruction of the garment (After Bocksberger 1978, Fig. 24).

the Bronze and Iron Ages. In the Bronze Age they are biconical and have a wide range of different weights, from about 5 to 70 g. Flat, discoid spindle whorls which are often found in Neolithic contexts are rare, and the change occurring is most likely due to the shift in fibre use from bast to wool. Spindle whorls with a smaller diameter rotate quicker than large flat ones, and are therefore more suitable for working with shorter fibres like wool.

Archaeozoological studies support this hypothesis, showing that there is an increase of sheep bones during the Bronze Age (Schibler *et al.* 1997, 346ff). Evidence from the remains of Early Bronze Age sheep demonstrates that sheep without horns already existed at the time, a trait that is a sign of selective breeding (Chaix 1977; Sidi Mamar and Gilloz 1995).

Conical and spherical loom weights in the Bronze Age layers demonstrate the use of the warp-weighted loom in this period, in use already during the Neolithic times (Rast-Eicher 1992). Ring-shaped loom weights are also common (Rast-Eicher and Reinhard 1997, Fig. 155.4). They may have had a function similar

to the semi-lunate weights of the southern Lagozza culture of which a few pieces have been found in Switzerland as well (Baioni *et al.* 2003; *cf.* Bazzanella in this volume).

New weaving tools that appear during the Late Bronze Age are spools (Rast-Eicher 2005), which have been interpreted as weights for tablet weaving (Fig. 19.6; *cf.* Gleba, Ræder Knudsen in this volume).

Hallstatt Period

Very few textiles from the Hallstatt period survived in Switzerland, especially in comparison with the following La Tène period. Some of the textiles were found in old excavations (*e.g.* Subingen SO, Ersigen BE), and only recently have more been discovered (Table 19.1). The old finds are all dated to Hallstatt D, while the new finds from Langenthal (BE) and Matran (FR) are dated to Hallstatt C. All graves of the Hallstatt period are rich and probably belong to the elite groups of society. The weaves are tabby or 2/2 twill. The fact that tablet-woven borders are absent from the material in the

old excavations is very probably due to poor documentation and the highly selective nature of the textile collection.

Fine and medium quality wool textiles are made of plied yarns (always S2z). Plying may be necessary to make the yarn made of the short, fine wool fibres stronger. On the other hand, coarse textiles with single yarns (z/s) are linked to coarse wool. Linen textiles were made of single yarns as the fibres are very long. This is a clear difference from the Bronze Age where predominantly plied yarns have been documented for linen threads and may be explained by the improved flax processing techniques, which enabled the production of longer fibres.

Textiles dated to the Hallstatt period were found in Tumulus 4 at Matran discovered in 2006 (Mauvilly *et al.* 2011). The tumulus is dated to Ha C and contained an inhumation grave. Grave goods included a sword and several small objects like rings and fragments of pins. The sword was broken in pieces and scattered over an area of 2–3 m². These pieces were covered by mineralised organic material (Fig. 19.7). The organic layers were as follows: in direct contact with the iron surface of the sword there was wood and probably a thin layer of leather from the scabbard. Then the entire sword/scabbard had been wrapped in a tablet-woven band. This was 2 cm wide and made with about 35 two-hole tablets (Fig. 19.8). In mineralised material colours are not preserved, but such bands were most likely woven in two or more colours. The

turning points of the tablet weave direction are probably where such changes of colour occur. On top of the band were two layers of skin, both with the fibres facing outwards. The first is a sheepskin, while the second is a goatskin (Fig. 19.9). As there are skin layers on both sides of the sword, they must have been used for the wrapping as well. On the other objects in the grave, traces of a very fine linen textile were documented. It appears to have been pinned – it was found mineralised on a tiny fragment of a pin – which suggests that it probably was part of a garment. This is a good example of wrapping of objects connected with inhumation burials. The tradition of wrapping objects deposited in graves is known throughout the Celtic period, also in other European areas (*cf.* Belanová-Štolcová, Bank-Burgess, Gleba in this volume).

Skin remains are rare in the Hallstatt period and their interpretation has to be made with great caution. For example, in grave 1 at Langenthal-Unterhard (BE) clearly visible fibres of a skin were found on an arm ring of the deceased. Scanning electron microscopy (SEM) revealed badger fibres (Fig. 19.10). A closer examination of the documentation of the excavation, however, revealed that these fibres did not in any way derive from an animal skin item covering the body, but rather from a badger, whose tunnel leading into the tumulus was discovered during the excavation (Rast-Eicher 2008a, 48–51).

The function of the textiles and skins is not easy to determine. In particular, the textiles

Table 19.1. Swiss textiles dated to the Hallstatt period.

Site	Canton	Date	Grave no	Inv/object	Twist	Weave	Material	Quality
Langenthal	BE	Ha C	grave 85	armring	?	?	wool	(fine)
			grave 86	iron ring	z/z	2/2 twill	wool	coarse
Matran	FR	Ha C	tumulus 4	sword	Sz/z	tablet weaving	wool	fine
				pin?	s/s	tabby	flax	fine
Kloten	ZH	Ha C2/D	tumulus	P53691	Sz/s	?	wool	coarse
Ersigen	BE	Ha D	tumulus 2	BHM 56078	Sz/z	2/2 twill	wool	medium
Subingen	SO	Ha D1	tumulus 3	119/2/3661	Sz/z	2/2 twill	wool	medium
			tumulus 3	119/2/3661	Sz/Zs+Sz	2/2 twill	wool	fine
			tumulus 3	119/2/3756	Sz/z	2/1 twill	wool	coarse
			tumulus 7	119/2/4071	Sz/z	2/2 twill	wool	medium
Sion, Don Bosco	VS	Ha D?	tumulus, grave 10	ring	s/z+s	2/2 twill	wool	?
Murten Löwenberg	FR	Ha D3	tumulus	“tent”				
Thunstetten	BE	Ha D3	tumulus 3	1979.25	s+z/s+z	2/2 twill	?	fine



Fig. 19.6. Üerschbhausen-Horn (TG): spools, Late Bronze Age (Photo: Kantonsarchäologie Thurgau).



Fig. 19.7. (far left) Matran (FR): sword from the Hallstatt C period (Service archéologique du Canton de Fribourg).



Fig. 19.8. Matran (FR): tablet-woven textile (Photo: A. Rast-Eicher).



Fig. 19.9. (below) Matran (FR): goatskin seen on the textile, tip of the sword (Photo: A. Rast-Eicher).

discovered in the beginning of the 20th century are not well documented, thus making it even more difficult to determine their use. Apart from possible (but not clearly detectible) parts of garments, the wrapping of objects seems to have been practised regularly (e.g. in Matran). Other items, like the textile from Murten-Löwenberg (Ha D3), appear to have been used for a completely different purpose. Here, pairs of long iron objects were found in a child's grave. The objects were partly stuck to the wooden boards, and a linen textile found on the iron has been interpreted as a tent stretched over the inhumation (Boisambert and Bouyer 1983).

Textile tools did not change significantly during the Hallstatt period from those used during the Bronze Age. For example, the warp-weighted loom has been documented in

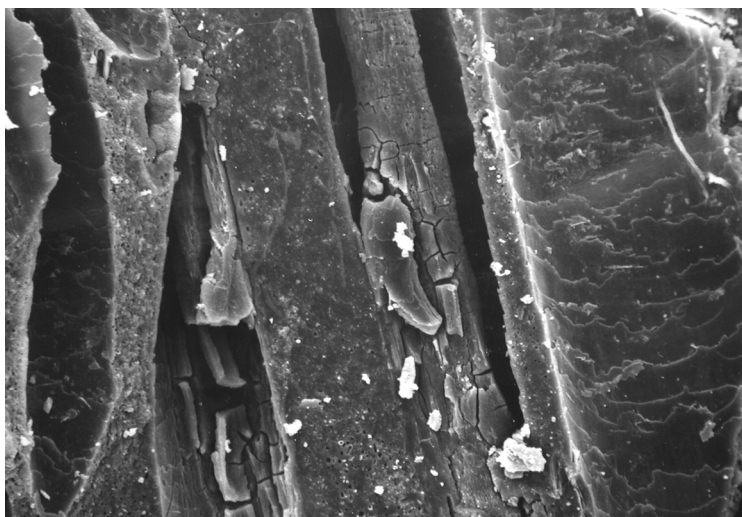


Fig. 19.10. SEM of badger fibres from the piece in Fig. 19.9 (Photo: A. Rast-Eicher).

Fig. 19.11. Brig, Gamsen (VS), prehistoric village of Waldmatte: loom weights made of stone, Early Iron Age (Photo: Fibbi-Aeppli, Musées cantonaux du Valais, Sion).

the Early Iron Age settlement of Brig-Glis/Gamsen-Waldmatte (Fig. 19.11). According to the excavator, a maximum of four weights were found in each house. These weights are special as they are made of stone (schist), a material which is usually not used in Switzerland for loom weights.

Wools of the Hallstatt C and D Period

The wool quality of seven textiles from the Hallstatt period has been analysed (Rast-Eicher 2008a). A preliminary examination focused on the fibres and the processing. A considerable difference between the Hallstatt and La Tène textiles was observed. The non-mineralised threads of the Hallstatt period

were all made of white wool (without medulla; Table 19.2). These threads had fibres sticking together, a fact which could be confirmed by comparisons with textiles from Eberdingen-Hochdorf in Germany (cf. Bank-Burgess in this volume). The only non-mineralised La Tène wool was heavily pigmented, and the fibres were loose. Based on the measurements, the fibres used in the Hallstatt period were short, white underwool (Fig. 19.13). The fibre diameter distribution curve is narrow and quite different from the later La Tène type wool distributions, such as the one shown in Figure 19.12. The best comparison is that of the wool of a Soay sheep (Fig. 19.13). Newly discovered mineralised textiles from Langenthal (BE) prove that *Mischwolle* from a fleece with different types of fibres in the same fleece was used (Fig. 19.14; Kun 1996; Rast-Eicher 2008a, 48–51). It can be concluded that the few textiles from the Hallstatt period demonstrate two types of fleeces used for textiles: the white underwool from a ‘Hairy sheep’ type as well as *Mischwolle*.

La Tène Period

In Switzerland, 422 textiles from 47 sites belonging to the La Tène period have been recorded, all of them grave finds. Of these, 408 are securely dated to Early, Middle or Late La Tène, while in 12 cases the date cannot be specified more precisely. Geographically, two thirds of the material was found south of the Alps (Mesocco and Canton Ticino). Many sites were excavated in the first half of the 20th century. Material from more recent excavations (especially after 1995) has also been analysed, providing more detailed results, which also focused on the context. With one exception, all the textiles are mineralised.

The state of preservation of the fibres varies geographically due to differences in geological conditions. South of the Alps, plant fibres are not well preserved in the local granitic soil. North of the Alps, the percentage of linen textiles rises to 38 % in Early La Tène (Table 19.3). Unfortunately it was only possible to differentiate between flax and hemp in a few cases. Otherwise, wool is dominant and, in some cases, it is possible to differentiate between wool from sheep and goats. The scales of sheep wool are thicker than goat wool, and the distribution of very fine to very coarse fibres is more pronounced for goat wool.

Site	No	Date	Preservation	Textile	No. measurements	Range	Quality
Matran	2006/	Ha C	mineralised	2/2 twill fine	94	7.24-31.5, 61	B
Langenthal	1998/	Ha C	mineralised	tabby	108		D
Langenthal	1998/	Ha C	mineralised	?	152		D
Ersigen	BHM 56078	Ha D	well preserved	2/2 twill medium	38	7.59-41.46	(AB)
Subingen	H.3/3756 (weft)	Ha D	well preserved	2/2 twill coarse	102	9.61-37.21	A
Subingen	H.3/3661 (coarse)	Ha D	well preserved	2/2 twill medium	24	10.27-27.88	(AAA)
Subingen	H.3/3361 (fine)	Ha D	well preserved	2/2 twill fine	34	8.41-21.57	(AA)
Subingen	H.6	Ha D	well preserved	2/2 twill	34	5.17-21.13	(AA)

Table 19.2. Wool qualities of the Hallstatt period.

Table 19.3. Material in La Tène graves.

Date	Sheep no.	Sheep %	Flax no.	Flax %	Total determined
Early Lt	97	92%	8	8%	105
Middle Lt	63	92%	5	8%	68
Late Lt	63	95%	3	5%	66
Total (n)	223		16		239

Table 19.4. Spin direction of the textiles dated to the La Tène period (LT = La-Tène).

Date	S2z/x	Z2s/x	z/z	z/s	not det. /other
Early Lt	2%	3%	65%	22%	8%
Middle Lt	-	3%	85%	2%	10%
Late Lt	-	-	79%	8%	13%
Total	n=8	n=7	n=177	n=32	

Table 19.5. 2/1 twill, 2/2 twill and tabby in Late Iron Age material.

Date	2/1 twill no.	2/1 twill %	2/2 twill no.	2/2 twill %	Tabby no.	Tabby %	Total
Early Lt	11	5%	142	69%	54	26%	207
Middle Lt	1	1%	33	35%	61	64%	95
Late Lt	1	1.5%	4	5.5%	64	93%	69
Total	13		179		179		371

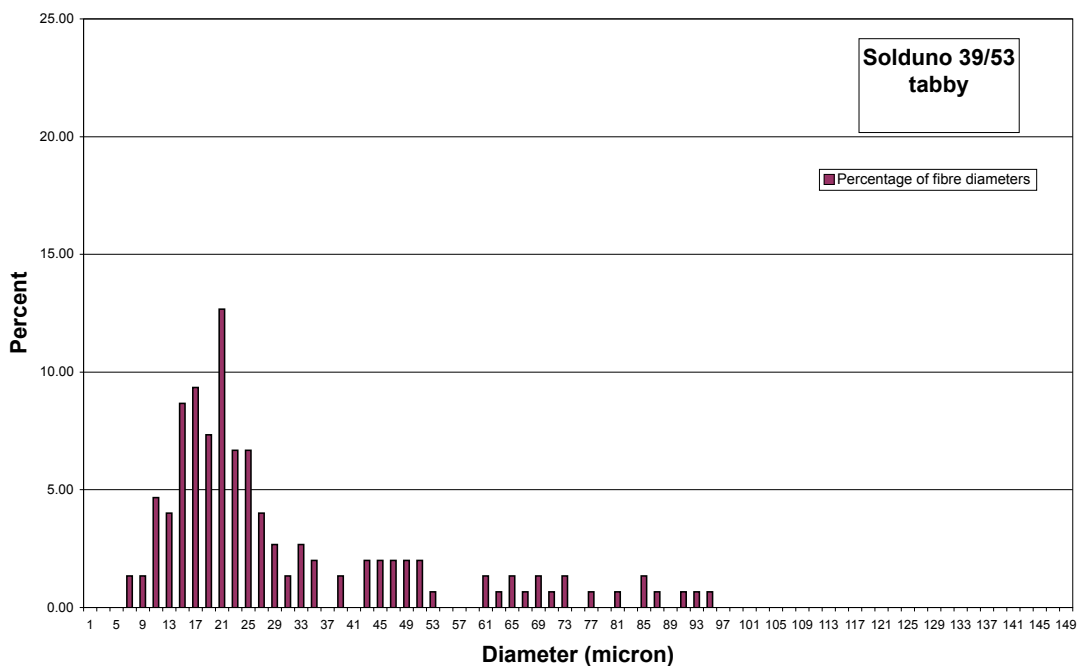


Fig. 19.12. Solduno 39/53: histogram of the wool quality.

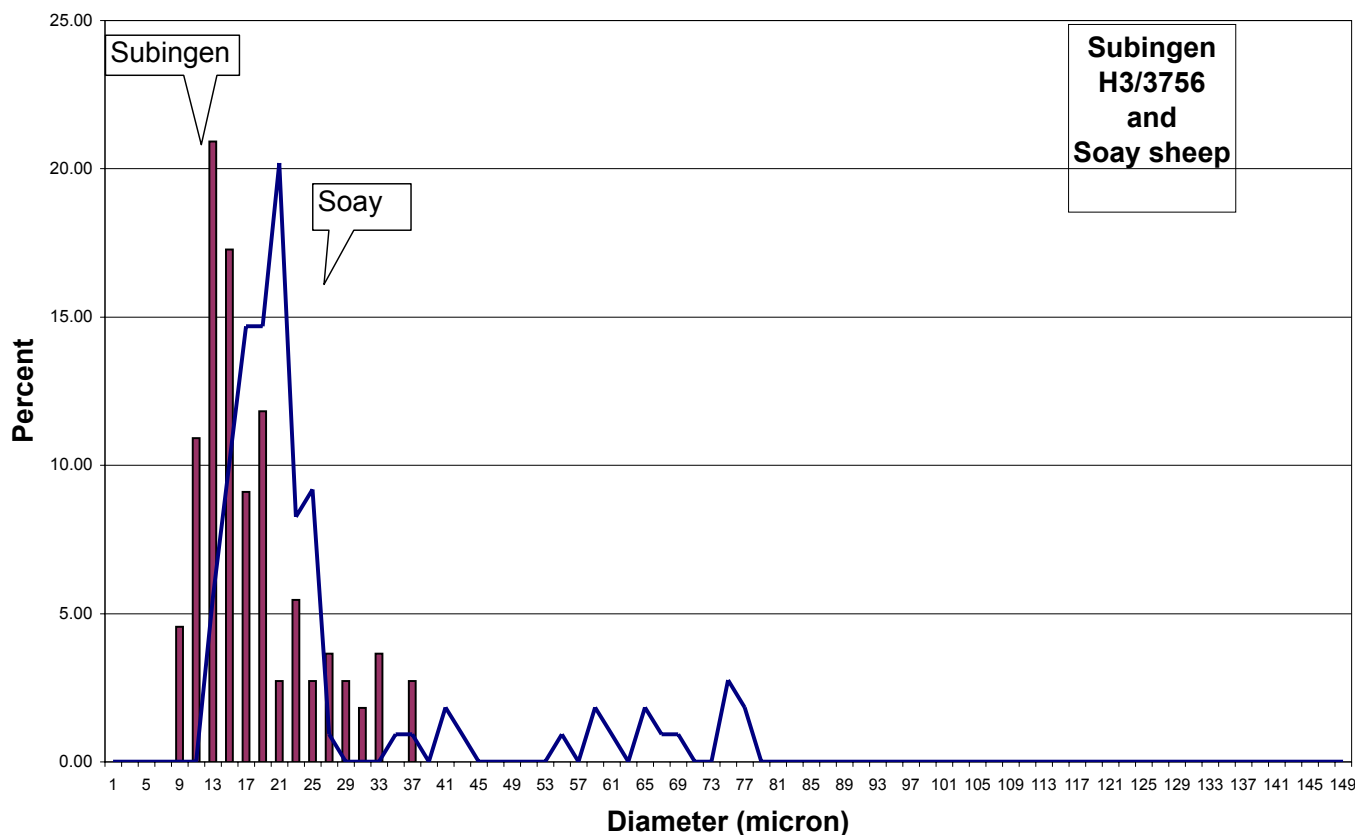


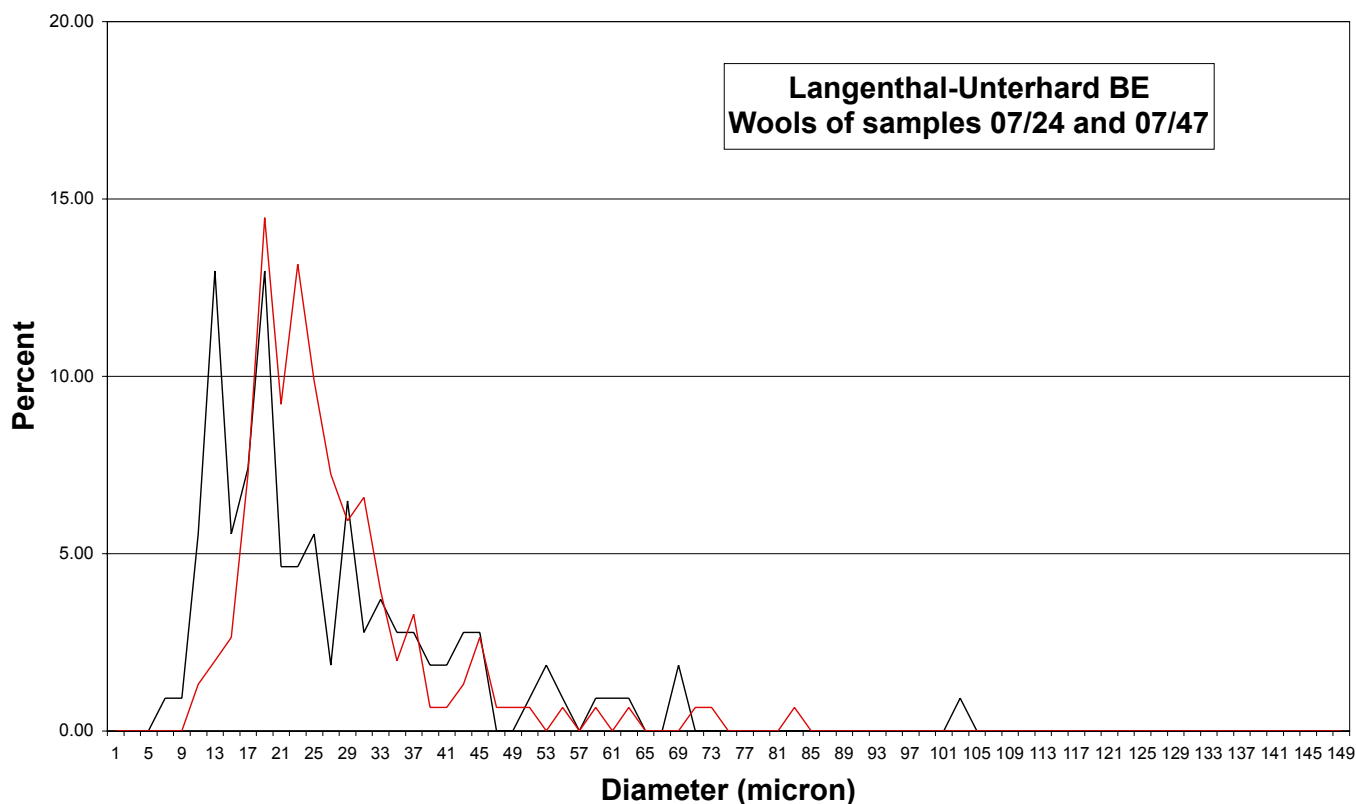
Fig. 19.13. Histogram of the wool quality from Subingen (SO), Hallstatt period and from a modern Soay sheep.

Plied yarns are rare in the La Tène period (Table 19.4). Most yarns are single, the textiles made of plant fibres always being z/z-twisted and wool textiles, z/z or z/s. Spin-patterning has been used mostly in one direction, with a change after two or four threads (2s–2z or 4s–4z; Fig. 19.15). This pattern is more frequent in the Early La Tène (8 %) than the Late La Tène (1.6 %). This may be due to the type of wool. According to the wool analysis, Early La Tène wools were often pigmented, enabling the creation of patterns such as stripes of different colours. The stripes are even more pronounced with the addition of spin-patterning. In Late La Tène, fine wools probably became available. A second reason could be more technical. The Early La Tène spin-patterned textiles are mostly quite coarse 2/2 twills with single yarns. Spin-patterning makes a textile more regular, neutralising an overly strong direction of the spin in the textile, especially when it is woven in single-spun yarns.

Table 19.5 lists the most important technical characteristics of the La Tène period textiles and demonstrates a change from mostly twills in Early La Tène to predominantly

tabbies in the Late La Tène (*cf.* Belanová-Štolcová, Grömer in this volume). This change is unrelated to the raw material used or the groups of objects such as fibulae, girdle plates or weapons on which textile traces survive. Other weaves, such as variations of 2/2 twill, half-basket and rep are rare. Rep more often constitutes starting borders or selvages rather than the ground weave.

The separation of material found north and south of the Alps (Fig. 19.16a–c) shows that, in the Early La Tène, weaves such as wool tabby, wool twill, flax/hemp tabby and flax/hemp twill are found in the north, whereas in the south 2/2 twill is dominant. In the Middle La Tène period, the variety of weaves is more limited and wool tabby becomes dominant in the north, while its percentage also increases in the south. In the Late La Tène, the shift to tabby, a development that began in the Middle La Tène in the north, continues. By the Late La Tène, the percentage of tabby is similar on both sides of the Alps. This development continues well into the Early Roman period: the fibulae from the graves dated to the first quarter of the 1st century AD in Solduno (TI) only contain wool tabbies.



The cemetery at Solduno (TI) is a good example for demonstrating the differences in the distribution and use of the textiles and other grave finds. This large cemetery near Locarno has been excavated since 1936, most recently in 2002. A total of 107 textiles from 69 graves have been documented, dated from the Early to Late La Tène period, while 18 textiles (from 9 graves) date to the Early Roman period (first quarter of the 1st century AD). There are enough examples to propose a horizontal stratigraphy of the textiles found on the fibulae from the excavations (Fig. 19.17). Thus, in Early La Tène graves (Lt B), the majority of the finds are twills. In sectors E and J with Middle La Tène (Lt C2) graves, both twills and tabbies have been found. In the southern, Late La Tène part of the graveyard, only tabby is represented, just as in the Roman period graves in the north.

Tablet-woven borders are missing in the La Tène material. This is partly due to the small size of the fragments. Another explanation could be that the social status or economic standing of the people buried in these graves is not as high as that of *e.g.* the 'princes' of

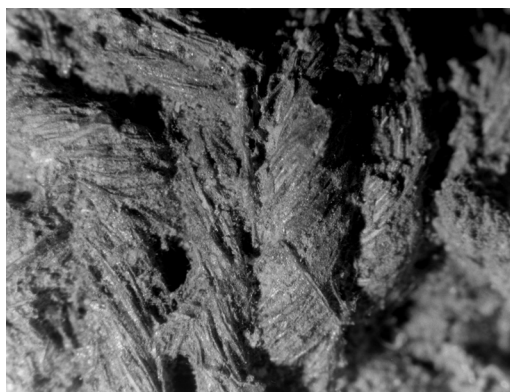
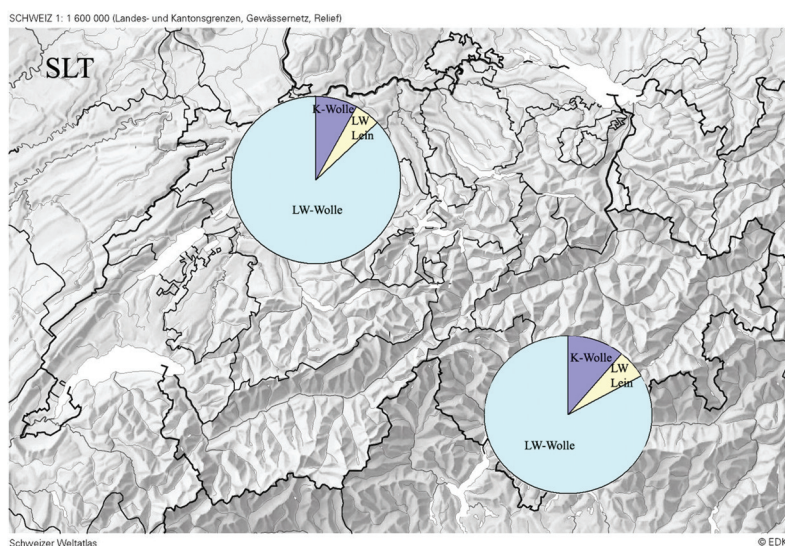
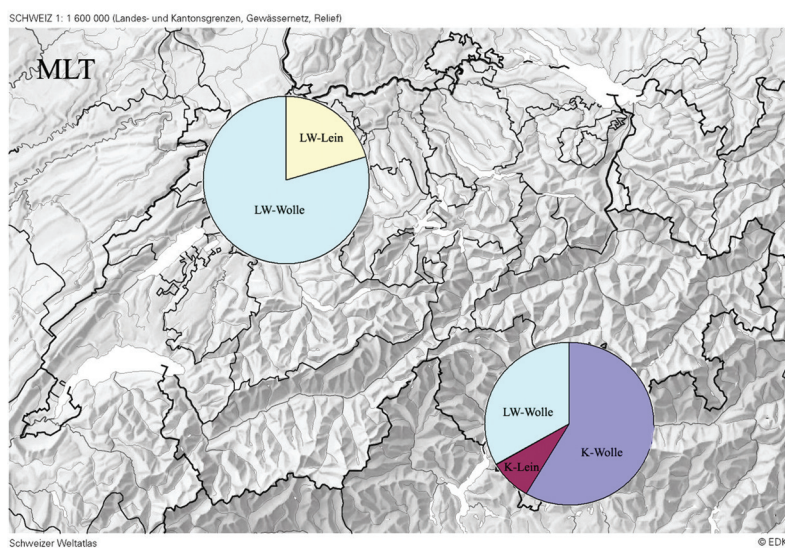
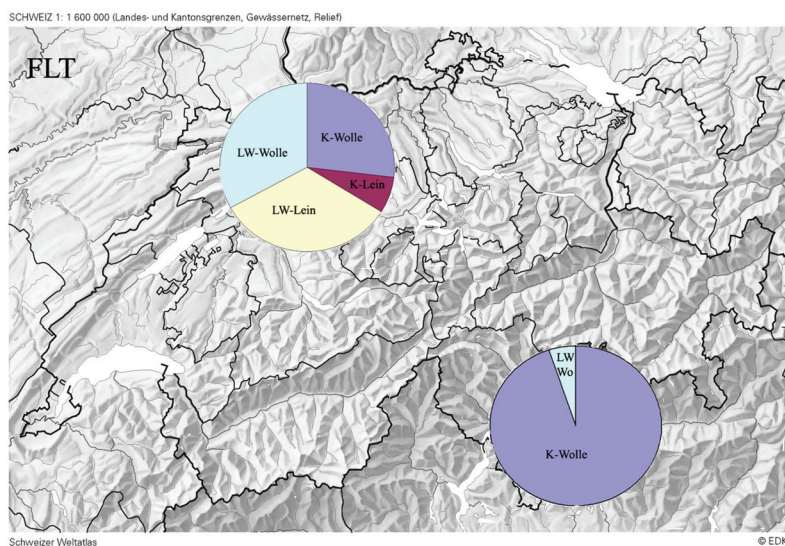


Fig. 19.14. Langenthal (BE): histogram of the wool quality, Hallstatt period.

Fig. 19.15. Gudo (TI), grave 137: spin-patterned Early La Tène textile (Photo: A. Rast-Eicher).

Eberdingen-Hochdorf (*cf.* Bank-Burgess in this volume) and Verucchio (*cf.* Stauffer, Raeder Knudsen in this volume), where wide tablet-woven borders have been preserved. In general, textile quality expressed by their thread count seems to be a marker of the social status of the deceased, and graves with richer objects generally have finer qualities of cloth.

The function of textiles is not always evident. In particular, the function of pins is difficult to establish. In Early La Tène graves, the position of the fibulae indicates that they



were not used to fasten a garment but rather a shroud (Table 19.6). For example, in a grave at Castaneda (GR) in eastern Switzerland (Fig. 19.18), the fibulae (leach or *sanguisuga* type) were found placed along the longitudinal axis of the body; while in a grave at Münsingen (BE) in western Switzerland, 11 fibulae were found placed on the central part of the body. In both examples, several fibulae were used to fix the same textile, a coarse wool 2/2 twill in Castaneda and a coarse wool tabby in Münsingen. Whether such coarse wool textiles could have been used for a mantle is not clear, but no doubt the textile was used as a shroud held in place by several fibulae. In some cases, leather bands were found mineralised at the fibulae, probably a reinforcement of the closing device. In some graves, it is even evident that there must have been more than one shroud, each of them fixed by fibulae.

This burial tradition appears to change during the Middle La Tène period, and in the Late La Tène contexts often a pair of fibulae is recovered in women's graves, one on each shoulder. We can suppose they fastened a garment as the textiles were found in direct contact with the fibulae (these textiles were always made in wool tabby).

Other objects deposited together with the body, such as weapons, are often wrapped in textiles. This tradition, already noted in the preceding period continued until the Early Medieval period (Horisberger *et al.* 2004). A warrior grave dated to the La Tène period excavated in 2004 in Bramois (VS grave 5) contained a male buried face downwards, his hands probably tied in front, clutching a goat's hoof. This inhumation is special and the cause of death has been a matter of debate. One suggestion is that the man had been executed as a punishment for a crime. The objects found in the grave include a sword, which was placed at the right side of the deceased. Above it, a scabbard from a different sword was placed separately, and on top of it, a lance. A shield was placed on the man's back. The sword, the scabbard and the lance were wrapped in a coarse textile. Sheepskin was found around the sword and the scabbard, with the furry side turned towards the inside (Fig. 19.19). It is possible that the body and the objects lay inside this skin which may have been a cape (Fig. 19.20). All the textiles found had been used to wrap the weapons and there were no textiles



Fig. 19.16a–c. (opposite)
Textile types north and
south of the Alps during
the La-Tène period:
FLT=Early La Tène,
MLT=Middle La Tène,
SLT=Late La Tène
(A. Rast-Eicher).

Fig. 19.17. (left)
Solduno (TI), horizontal
stratigraphy (Drawing:
A. Rast-Eicher).

Site	Grave	Object	Date	H	B	S	A	Th/cm	Patt.	Wool	Remarks
Münsingen	102	fibula	Early Lt		•••••			6/6	tabby	-	same textile on 3 fibulae
Castaneda	88	fibula	Early Lt				•••••	6/6	2/2 twill	E	1976.7
Vidy	145	fibula	Late Lt		•	•• li/re		8/8 6/6	tabby tabby	A	
	124	fibula	Late Lt			•• li/re		8/5 10/6.5	tabby tabby	A	

which could be interpreted as clothing. Thus, the only garment present was in all probability this skin (Rast-Eicher 2008a, 103ff).

While no important changes in spinning and weaving tools seem to occur during the La Tène period, two important new implements for textile production were introduced: the iron shears and the iron comb. The earliest shears appear in La Tène C graves (there are only a few

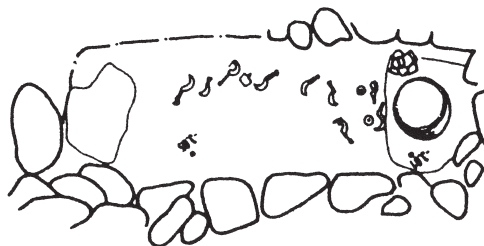


Fig. 19.18. Castaneda (GR), grave 1967.7/8 (After Rageth 1992, Fig. 1).

Table 19.6. Examples
of Early and Late
La Tène graves with
placement of fibulae
and Rast-Eicher type of
textile. • = 1 fibula.
H = Head; B = Breast;
S = Shoulder; A = long
Axis.

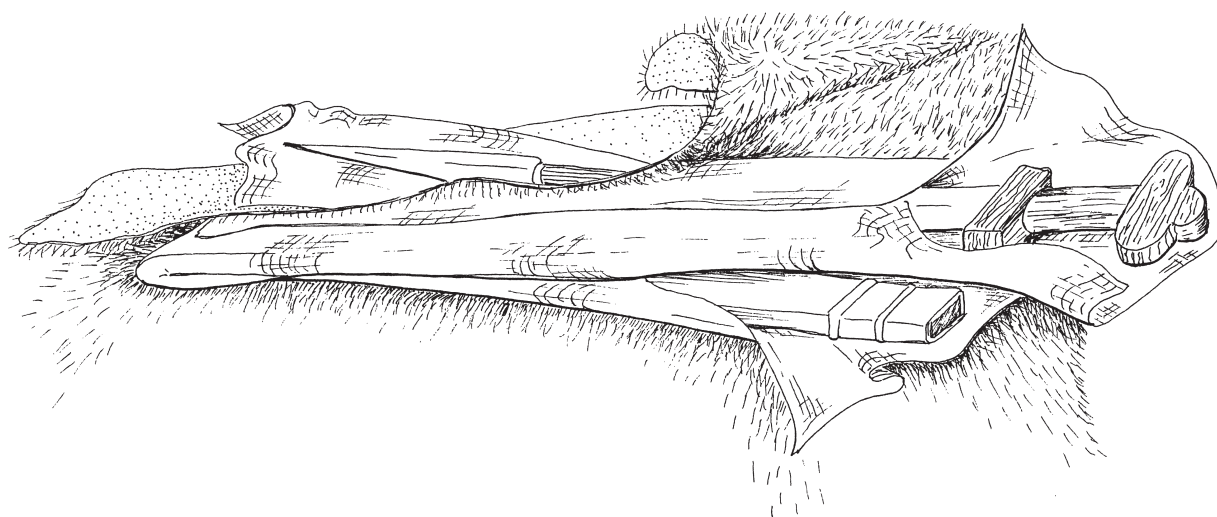


Fig. 19.19a. (right) Bramois (VS), grave 5: upper part of the sword (blade and part of handle) with skin over and under the sword (Photo: A. Rast-Eicher).

Fig. 19.19b. (above) Bramois (VS), grave 5: reconstruction of the wrapped grave goods (Drawing: E. Steiner, from Rast-Eicher 2008a, Fig. 146, © Archäologie Schweiz).

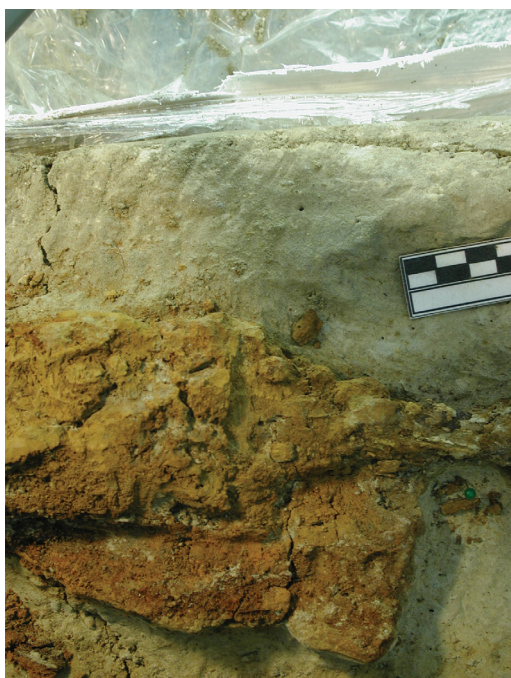
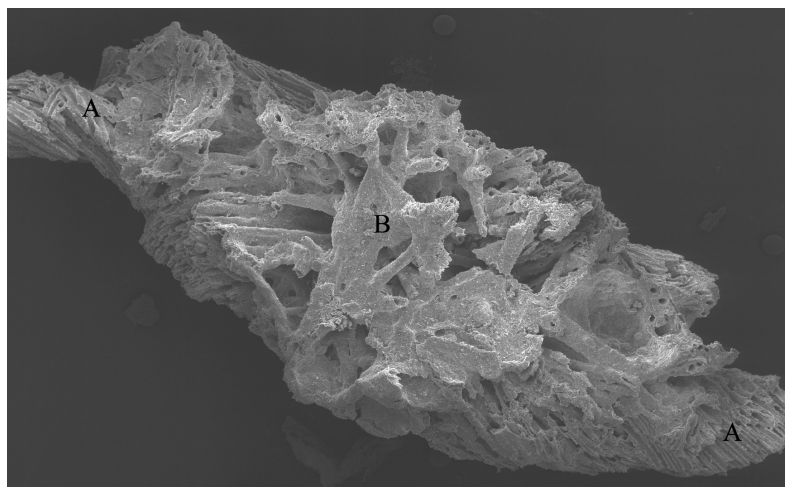


Fig. 19.20. (below) Bramois (VS), grave 5: textile (A) and skin (B) found around the sword (Photo: A. Rast-Eicher).



in La Tène B), often in rich male inhumations. It is possible that the shears were deposited in the graves as a symbol of power and wealth (cf. Gleba in this volume). The iron comb was used in the preparation of the wool fibres. The wool was combed with a warm iron comb to retain the straight long fibres, while the short fibres were discarded. Such aligned wool fibres are observed in threads from Late La Tène (LT D) contexts (Fig. 19.24).

Wools of the La Tène Period

For the La Tène period, 66 textiles from nine sites were analysed (Table 19.7).² The graves are dated from the Early to Late La Tène, the mid-5th century to 15 BC. The Early La Tène grave of Uitikon-Üetliberg (ZH) is a rich tumulus grave with remains of a chariot and imported Attic black-figure pottery (Drack 1981). A high quality textile found with one of the golden fibulae is made of very fine wool (quality AA). This wool is unique in the La Tène context and the fibre diameter distribution curve fits neither the Hallstatt wool data nor the other Early La Tène curves. Therefore, this textile is possibly an import.

Early La Tène wools from sites of Castaneda (GR), Solduno (TI), Münsingen (BE), and St. Sulpice (VD) are coarse: generally of qualities C and D, and in two cases quality AB (from St. Sulpice). In some graves, goat wool was found. In the material from Castaneda is a textile, which is well preserved, whereas the others are all mineralised (Fig. 19.21). In Table 19.7, the wools from Castaneda are listed as representative of Early La Tène wools. It is interesting to compare the well-preserved

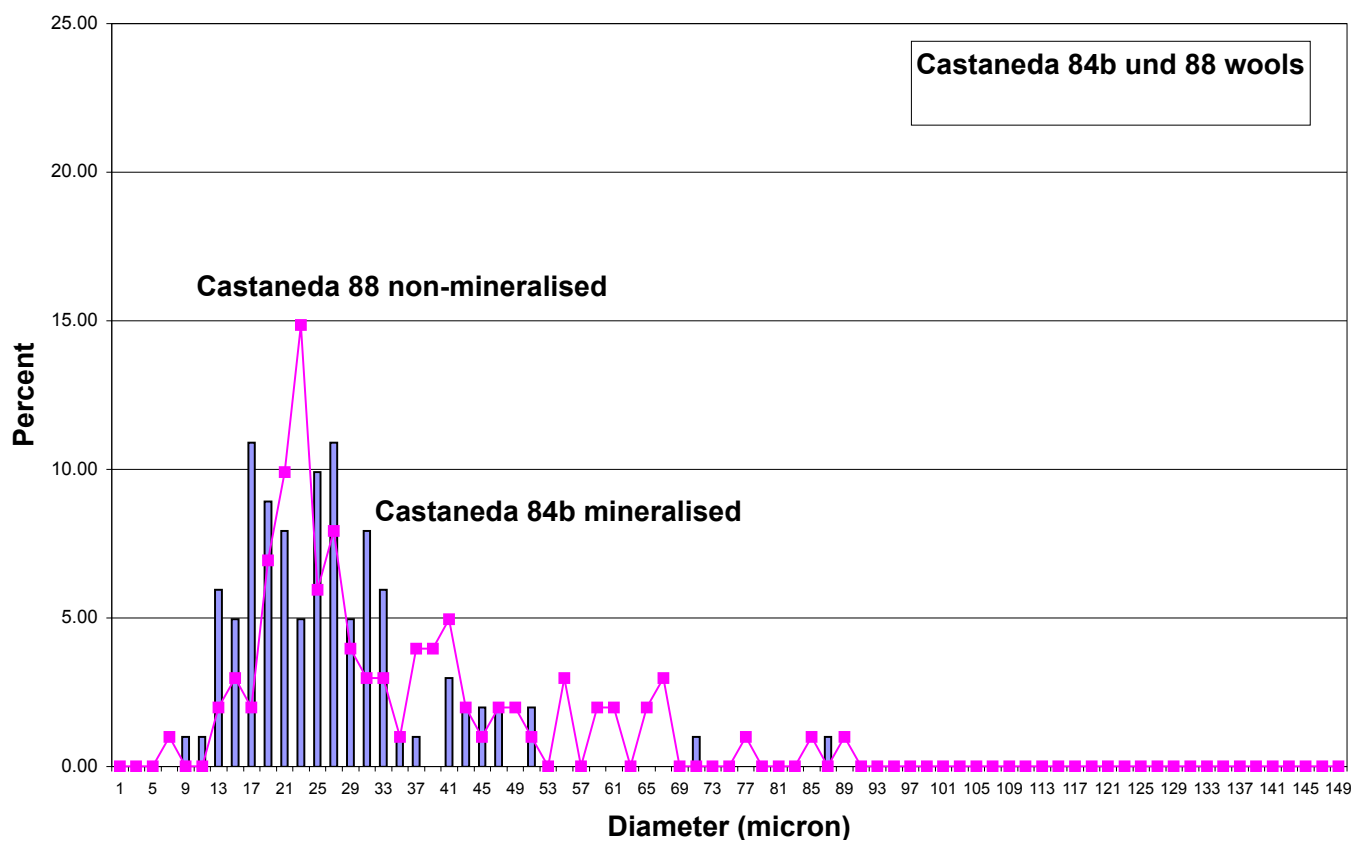


Fig. 19.21. Castaneda (GR): histogram of mineralised (84b) and non-mineralised (88) wool.

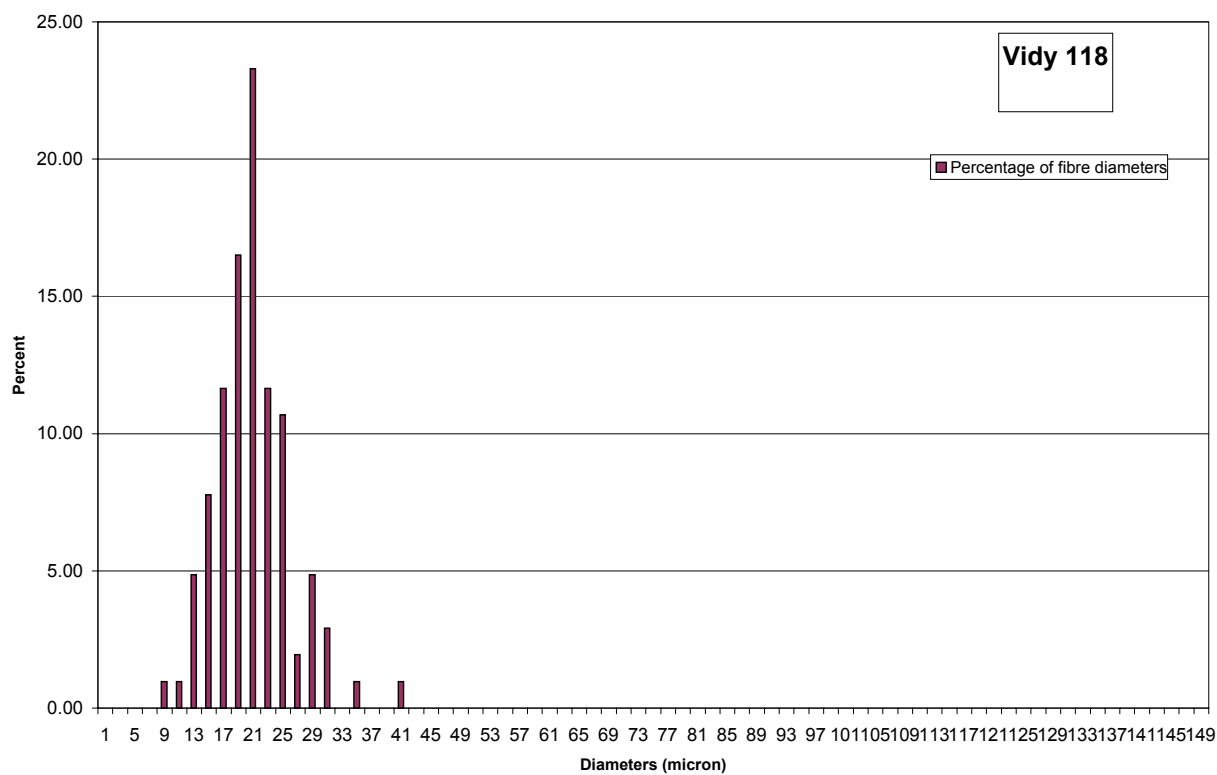


Fig. 19.22. Vidy (VD): histogram of Late La Tène wool.

Fig. 19.23. Castaneda (GR), grave 88: thread, Early La-Tène (Photo: A. Rast-Eicher).

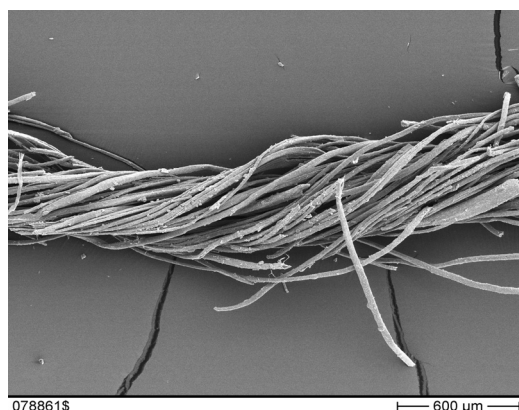
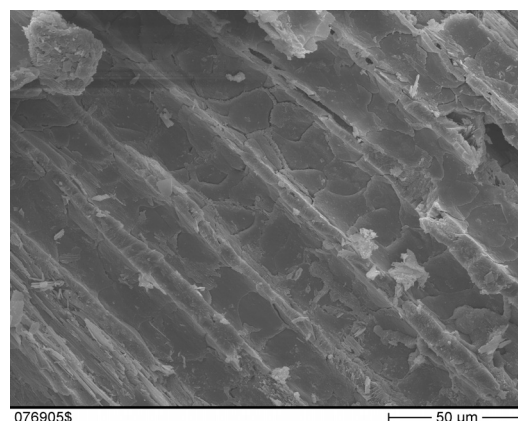


Fig. 19.24. Bramois (VS), grave 5: combed wool fibres of a fine textile (Photo: A. Rast-Eicher).



Site	No	Date	Preservation	Weave	Total no. of measurements	Range	Quality
Uitikon-Üetliberg	SLM 56977	Lt A	mineral.	? (twill?)	111	9–25, 29, 33, 40	AA
Castaneda	88	Lt B	well preserved	2/2 twill coarse	100	6–67, 85, 89	E
Castaneda	IIIC23d	Lt B	mineralised	2/2 twill coarse	106	9–49, 53–57, 63–65, 73, 81, 97	D
Castaneda	IIIC84b	Lt B	mineralised	2/2 twill coarse	100	9–37, 41–47, 51, 63, 71, 87	D
Castaneda	IIIC147	Lt B	mineralised	2/ 2 twill coarse	106	5–59, 63, 76	D
Castaneda	IIIC107	Lt B	mineralised	2/2 twill coarse	104	11–45, 57, 61	C
Castaneda	IIIC69	Lt B	mineralised	2/2 twill coarse	229	9–57, 61, 63, 67, 85, 117	D
Vidy	107	Lt D2	mineralised	tabby	61	9–34	A
Vidy	118	Lt D2	mineralised	tabby	60	9–41	A
Vidy	124	Lt D2	mineralised	tabby	36	9–34	A
Vidy	145	Lt D2	mineralised	tabby	53	9–37	A
Vidy	148.8	Lt D2	mineralised	tabby	132	9–39	A
Vidy	148.65	Lt D2	mineralised	tabby	106	9–48	A
Vidy	206.6	Lt D2	mineralised	tabby	68	9–39	A

Table 19.7. Wool qualities of the Early and Late La Tène period.

but non-mineralised and mineralised fibres: the quality of the non-mineralised fibres is coarser (with unfortunately only one textile being preserved), which may be due to the preservation conditions and slight shrinkage during the mineralisation process of the fibres.

At the Middle La Tène sites of Solduno (TI), Muri-Mettlen (BE) and Bern-Enge (BE), wools of different qualities were found, ranging from A to C. Some D-type wools were also identified, but only from Solduno (Rast-Eicher 2008a, 142ff).

There is a clear change towards fine wools in Late La Tène sites. Thus, at Vidy (see Table

19.7), all the measurements have yielded an A-quality, and the histograms show symmetrical fibre diameter distribution curves for the first time (Fig. 19.22).

In some cases, there is an obvious link from the wool quality to the function of the textile. In the Early La Tène Grave 88 from Castaneda, a coarse 2/2-twill woven in coarse wool was recovered with six fibulae found along the axis of the grave (Figs 19.18 and 19.23). This textile was most probably a shroud, or maybe a cloak. A Middle La Tène grave from Muri-Mettlen (BE) contained a fine quality textile made of fine wool (quality A) preserved on fibulae which were placed on each shoulder, a frequently

occurring position for fibulae in Late La Tène graves. Coarse wool was probably not very suitable for such clothing.

During the Late La Tène period, a change also occurred in the processing. The analysis of a textile from Bramois (grave 5) has shown very fine fibres that were straight and very regular in diameter (Rast-Eicher 2008a; Fig. 19.24). Wool fibres usually – and especially in a La Tène context – do not look that straight. Therefore, it is assumed that this wool was combed. Such processing is known from the Roman finds, at the latest in the 1st century AD (Wild 1970, 25–26), and it seems that this technique was already used for fine textiles in the late La Tène period (Lt D), at the same time as finer wools begin to appear north of the Alps, perhaps influenced by Roman sheep breeding and fibre processing.

Conclusions

Neolithic finds from Swiss lake dwellings constitute a large corpus of linen textiles (all tabbies) in different qualities, some of them very fine and regular. Bronze Age textiles are rare, but few items are preserved, especially the well-known textile from Pfäffikon-Irgenhausen. In Hallstatt and La Tène period grave finds, organic material is mineralised in close contact with metal objects. All this material has to be seen as an integral part of the inhumation burial custom and belongs to the costume of the deceased or other items such as shrouds. Objects deposited in such graves are usually wrapped in textiles.

The investigation of the predominantly mineralised and small textile fragments found in Iron Age inhumation graves in Switzerland has provided both an overview of the textiles used for inhumations, but also an impression of the technical developments, in particular, those linked to sheep breeding. At the end of the La Tène period, white and fine wools became available. A general shift from twills to tabbies suggests not only a change of costume but possibly also a development towards an increasingly standardised production of textiles.

Acknowledgements

I would like to thank Elizabeth Wincott Heckett for the English corrections to my manuscript.

Notes

- 1 Abbreviations in brackets refer to the Swiss cantons: BE – Bern, FR – Fribourg, GR – Graubünden, LU – Lucerne, NE – Neuchâtel, SO – Solothurn, TG – Thurgau, TI – Ticino, VD – Vaud, VS – Valais, ZH – Zürich.
- 2 Uitikon-Üetliberg (ZH), Castaneda (GR), Münsingen BE, Solduno (TI), St-Sulpice (VD), Vevey (VD), Muri-Mettlen (BE), Vidy (VD), Bern-Enge (BE).

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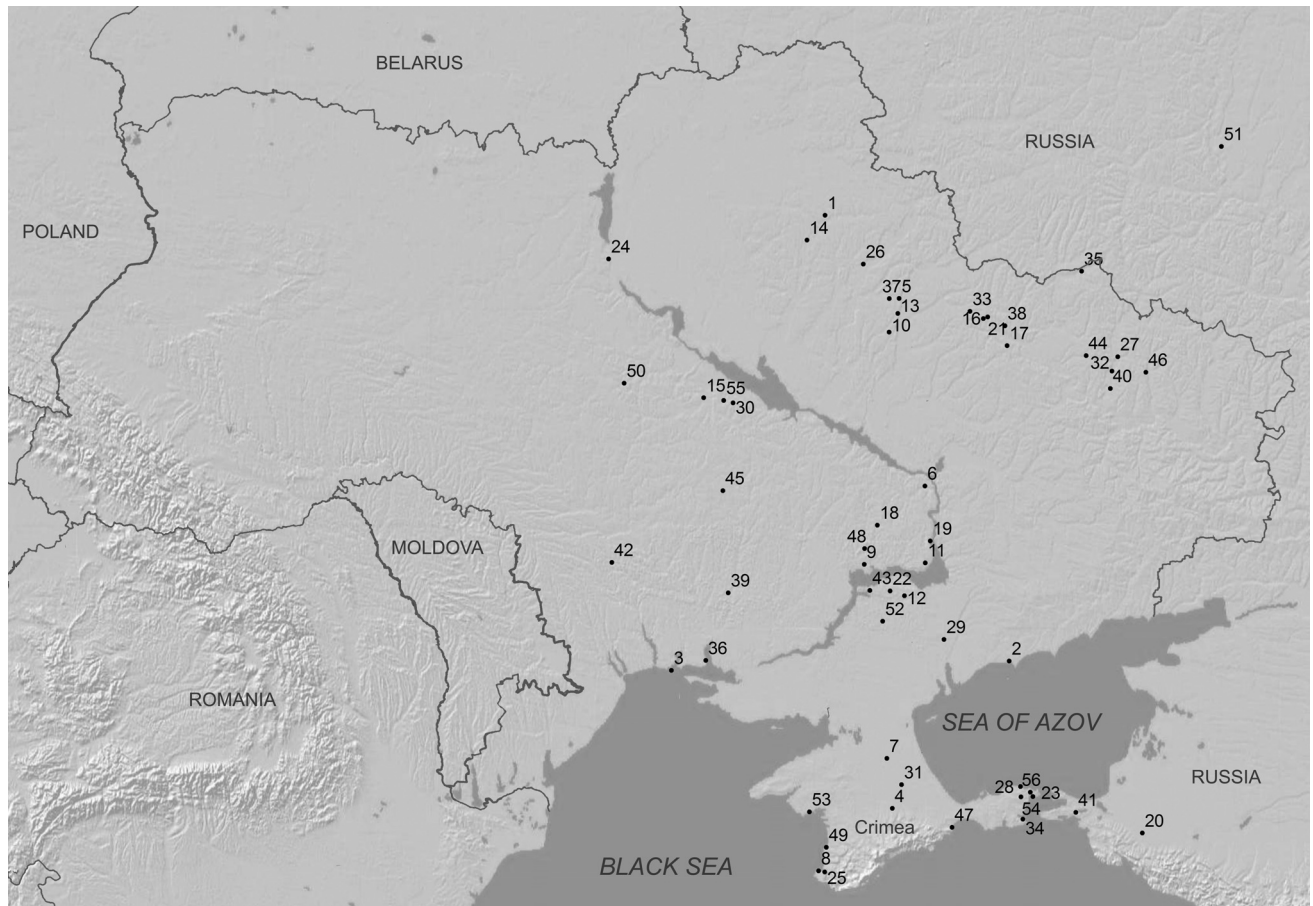
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UKRAINE

Eneolithic period	4000–2000 BC
Early Bronze Age	2000–1600 BC
Middle Bronze Age	1600–1200 BC
Late Bronze Age	1200–900 BC
Early Iron Age	900–750 BC
Scythians	750–300 BC
Greek colonies	630–63 BC
Sarmatians	150 BC–AD 250
Romans	63 BC–AD 240
Goths	AD 240–375
Huns	AD 375–550

UKRAINE



Map 20.1. Ukraine. Sites mentioned in Chapter 20:

- | | | |
|----------------------------|-----------------------------|---------------------------------|
| 1 Basovske Horodyshche | 20 Karagodeuashkh | 39 Pisky |
| 2 Berdians'kyi Kurhan | 21 Karavan | 40 Pisky Rad'kivs'ki |
| 3 Berezan' | 22 Kazenna Mohyla | 41 Semibratniye Kurgani |
| 4 Besh-Oba | 23 Kerch | 42 Sokolova Mohyla |
| 5 Bilske Horodyshche | 24 Kiev | 43 Solokha |
| 6 Blyznets' 2 | 25 Kilen-Balka | 44 Stanislavka |
| 7 Bolotne | 26 Knyshevske Horodyshche | 45 Sugokleya |
| 8 Chersonesos | 27 Kolisnykivka | 46 Svatova Luchka |
| 9 Chortomlyk | 28 Kul'-Oba | 47 Theodosia |
| 10 Dmitrenkiva Balka | 29 Melitopol's'kyi Kurhan | 48 Tovsta Mohyla |
| 11 Dniprorudne | 30 Motronyns'ke Horodyshche | 49 Ust'-Al'ma |
| 12 Haimanova Mohyla | 31 Nogaichik | 50 Velykyi Ryzhanivs'kyi Kurhan |
| 13 Heyevy Mohyly | 32 Novoplatonivka | 51 Voronezhs'ki Kurhany |
| 14 Hlyns'ke Horodyshche | 33 Novyi Merchyk | 52 Vyshneva Mohyla |
| 15 Holodnyi Yar | 34 Nymphaion | 53 Yevpatoriya |
| 16 Horodyshche | 35 Okhrimivka | 54 Yuz-Oba |
| 17 Hryshkove | 36 Olbia | 55 Zhabotyń |
| 18 Kam'yana Mohyla | 37 Pereshchepyne | 56 Zolota Mohyla |
| 19 Kam'yans'ke Horodyshche | 38 PISOCHIN | |

Ukraine

Margarita Gleba and Tatiana Krupa

Introduction

With its complex cultural history and its geographical position at the crossroads between Europe and Asia, Ukraine has been one of the major gateways of eastern influences to Europe for many centuries during prehistory. It is hardly surprising that such materials and techniques as embroidery, gold thread, resist-dyed textiles and silk, generally believed to originate in the east, have been abundantly found on its territory. The most spectacular examples of Graeco-Roman and Scythian textiles, for the most part excavated during the 19th and early 20th centuries, are currently in the collection of The State Hermitage Museum in St. Petersburg, Russia. Since then, many new finds have been made, particularly in the last 20 years after the country's independence, and many of these have been scientifically investigated. The present chapter is the first attempt to summarise the available information on archaeological textiles found on the territory of Ukraine. However, it is hoped that in the near future investigations will allow a more thorough overview.

Chronological and Cultural Background

Ukraine's territory consists of three geo-

graphical zones: the forest-steppe zone in the central-northern and western parts, including the Carpathian Mountains; the vast and fertile steppe in its southern part that stretches towards the Danube basin in the west and into Asia towards the east; and the coastal regions of the Black Sea and the Sea of Azov.

The territory of Ukraine has been inhabited ever since the Palaeolithic (*c.* 20,000 BC). At the beginning of the Eneolithic (5000–2000 BC), cereal agriculture and animal husbandry were introduced, leading to the sedentary way of life. The earliest evidence for textiles in Ukraine dates to the Eneolithic period, specifically, to the Cucuteni-Trypillia culture which flourished between *c.* 4000 BC and 3000 BC in the Dnipro-Dnistro¹ area, *i.e.* modern Romania, Moldova and central and northern Ukraine (Mallory 1997a). Cucuteni-Trypillian settlements, some of which had 10,000–15,000 inhabitants, were laid out in oval or circular patterns, with rows of often interconnecting, single and two-storied dwellings.

Almost contemporary to, and in contact with it, the Serednij Stog culture (4500–3500 BC) occupied the steppe region just north of the Sea of Azov between the Dnipro and the Don (Mallory 1997b). The Serednij Stog culture is a generic term that covers a multitude of smaller cultures all of which subsisted on animal husbandry. It presents perhaps the

earliest evidence of horse domestication, indicated by the finds of cheek pieces (*psalia*). The dead were inhumed in ground-level pits but without the use of burial mounds, which characterise the burial practices of all subsequent cultures.

The Serebnij Stog culture was succeeded by the Early Bronze Age Yamna (Pit Grave) culture (3600–2000 BC) in the Pontic Steppe region (Mallory 1997c). Characteristic for this culture are the inhumations in pit graves located under burial mounds or kurhans, with the dead body placed in a supine position with bent knees and covered in ochre. Almost contemporaneously with the Yamna culture, the Crimea is characterised by the Kemi-Oba culture (3700–2200 BC; Mallory 1997d), while northern Ukraine was home to the Middle Dniro culture (3200–2000 BC), which is seen as the eastern extension of the Corded Ware culture (Mallory 1997e).

During the Bronze Age, cattle-breeders occupied the steppe zone, and farmers settled along rivers of the forest-steppe zone of Ukraine. The Catacomb culture (2000–1600 BC) is an Early Bronze Age culture, which possibly developed from the Yamna culture (Mallory 1997f). It incorporates several smaller archaeological cultures. Burial practices were similar to those of the Yamna culture, but instead of a pit, the space of the main burial shaft was hollowed-out, creating a ‘catacomb’. The culture was the first to introduce corded pottery decorations into the steppes through extensive contacts with the Corded Ware cultures occupying the north-western regions of Ukraine, and demonstrates an intensive use of the polished battle axe, providing a further link to the west. The Catacomb culture was ousted by the Srubna culture, associated with the expansion of the Iranian-speaking peoples.

The Babino or Mnogovalikova Ware (KMK) culture developed on the right bank of the Dniro River in central-northern Ukraine during the Middle Bronze Age (1700–1500 BCE). It is characterised by elaborately decorated ceramics. The Srubna (Timber-Grave) culture (1600–1200 BC) occupied the area along and above the north shore of the Black Sea from the Dniro eastwards, along the northern base of the Caucasus to the area abutting the north shore of the Caspian Sea, across the Volga (Mallory 1997g). Here it

bordered the approximately contemporaneous and somewhat related Andronovo culture. The historical Cimmerians may have been the descendants of this culture.

During the Late Bronze Age, there is a certain decline in the material culture, documented archaeologically by a significantly reduced level of agriculture and metallurgy and decline in the number of settlements. This period is associated with the Bilozers’ka culture. Thracian tribes from the west have also occupied part of the south-western Ukraine.

The Iron Age in Ukraine is characterised by successive invasions of Iranian-speaking tribes which are collectively known as Cimmerians, Scythians and Sarmatians. Cimmerians were the first of the Iron Age cattle-breeding nomads to occupy the territory of Ukraine (Ivanchik 2001). The Cimmerians began to smelt iron from mud ore. From the end of the 8th century and throughout the 7th century BC, numerous Scythian tribes invaded the Black Sea steppes, assimilating the Cimmerians and moving west to the Danube River.

The name ‘Scythian’ is generally used to refer to various Indo-Iranian peoples seen as similar to the historically known Scythians. Most of the surviving information about the Scythians comes from the Greek historian Herodotos and archaeologically from the spectacular finds from Scythian burial mounds excavated in Ukraine and Russia. They were horse-riding nomadic pastoralists.

The Scythian dead were buried in mounds known as kurhans (Russian: kurgans), some of which were over 20 m high and more than 100 m in diameter, and which remain the most prominent landmarks in the steppe region of Ukraine to this day. Elite members of society were accompanied by rich grave goods, especially gold decorations, which to a large extent characterise Scythian archaeological material. The “Scythian triad” of weapons, horse-harness and Scythian-style wild-animal art have been the traditional indicators of Scythian burials.

The so-called Scythian kingdom existed from 750 to 300 BC (Polin 1992, 99–123; Murzin 1998, 71–72; Alekseev *et al.* 2001; Alekseev 2003, 251). During this period, the steppe region of Ukraine was occupied by the nomadic Scythians, who also had small settlements on the shores of the Dniro. The population of the forest-steppe region to the north was

sedentary and subsisted on agriculture. This population built many extensive hill fort settlements, known as *horodyshche*. Several of them have been excavated, the largest of which is Bils'ke Horodyshche in the Poltava region (Shramko 1987). The city's commanding ramparts and vast area of 40 km² exceed even the outlandish size reported by Herodotos. Its location at the northern edge of the Ukrainian steppe would have allowed strategic control of the north-south trade routes.

Nomadic Scythians lived in confederated tribes, a political form of voluntary association which regulated pastures and organised a common defence against enemies. Since their pastoral economy also needed supplementary agricultural production, stable nomadic confederations developed either symbiotic or forced alliances with sedentary populations in exchange for animal produce and military protection. The Scythians apparently obtained their wealth from their control over the slave trade from the north to Greece through the Greek Black Sea colonies. They also grew grain, and traded wheat, cattle flocks, salted fish and cheese with Greece.

The first Greek colonies were established in the northern coast of the Black Sea during the 7th century BC (Tsetskhladze 1998; Boardman 1999). The earliest colony is believed to be the island (then peninsula) of Berezan' (Solovyov 1999), which was later transferred to the site of Olbia (Braund and Kryzhitskiy 2007); both were founded by the Greek city-state of Miletos and located at the mouth of Pivdennyi Bug, west of the Crimean Peninsula. Later, Greek colonies sprang up all along the coast of the Crimea, the most prominent of them being Kerkinitis (present-day Yevpatoriya) on the western coast, Chersonesos (present-day Sevastopol') on the southern coast, and Theodosia, Panticapaion (present-day Kerch) and Nimphaion on the eastern Kerch Peninsula. The Greeks showed a preference for strategic positions on peninsulas and islands and proximity to trade routes, large rivers and waterways. By the end of the 6th century BC, Greek settlements established their agricultural territories (*chora*) and craft production (pottery and metalwork), and were characterised by stone architecture and town planning (Tsetskhladze 1998). By the 5th century BC, the Greek states of the Kerch and Taman Peninsulas bonded together to

create the Bosporan Kingdom. Complex relationships existed between Greeks and the local populations but there is abundant evidence of exchange, documented by the numerous finds of Greek objects such as pottery, transport amphorae and toreutics in Scythian burials. Textiles were also likely to be an important material of exchange between the various populations interacting on the northern Black Sea littoral.

In the 4th century BC, King Ateas united the Scythian tribes under a single state, which however disintegrated after the Scythians lost the war against Philip II of Macedon in 339 BC. In the ensuing power vacuum, the steppe and forest-steppe region were abandoned. Eventually, during the 2nd century BC, Scythians established new settlements in the lower Dnipro region and Crimea, collectively known as Scythia Minor, which existed until the end of the 3rd century AD. The Scythian economic structure underwent profound changes during this time, as they become settled, subsisting on agriculture and stock-breeding. The kurhan burials disappeared, giving way to simple cemeteries.

During the second half of the 2nd century BC, a new wave of nomadic tribes appeared, the Sarmatians (Simonenko 1998). Although, unlike the Scythians, the Sarmatians never established a united state, ancient historians soon started to refer to the area as Sarmatia. Like the Scythians, they were not a united ethnic unit but rather a number of nomadic peoples of similar stock (*e.g.* Aorsi, Iazygi and Roxolany) who arrived in the territories of Ukraine in waves (Brzezinski *et al.* 2002). The Alans were essentially of the same Iranian stock as the Sarmatians but are often considered a distinct ethnic group. The western border of the territory controlled by the Sarmatians in the 1st century AD passed along the river Dnipro and by the 2nd century AD reached the Visla River. In the 1st century BC, they made incursions into Parthian lands, and ravaged Rome's Danubian provinces of Pannonia and Moesia. During this time they also maintained close ties with Graeco-Roman centres, many of which continued under Roman rule. The Sarmatians are known through Graeco-Roman ethnography and, archaeologically, through burials. The Sarmatians were weakened by the incursions of Goths from the north during the 3rd century AD, and they completely

disappeared after the Hun invasions at the end of the 4th century AD.

Research History

Many intriguing textile finds have been mentioned, if briefly, in old and recent publications, although few of them have been studied systematically until recent times. In 1881, Stephani provided one of the first and extremely detailed descriptions of the magnificent textile finds from the Graeco-Roman burials of southern Ukraine (then Russia).

The first scientific investigations of archaeological textiles found on the territory of the USSR (of which Ukraine was a part until 1991) were undertaken as a result of Kozlov's discoveries of Mongolian textiles in the 1930s (Trever 1932). These analyses included morphological investigations and chemical tests (Voskresenskij and Kononov 1932; Khvalkovskij and Voronkov 1932). However, already in 1929, Farmakovskij proposed a list of the essential methods of conservation for the ancient textiles found during excavations (Farmakovskij 1929), in particular the methods of retrieval, cleaning and conservation.

In the 1960s, Fedorovich published "A methodology of investigation of archaeological textiles", which prioritised the investigation of textile structure, fibre identification and dye analyses (Fedorovich 1965). In the following decades, various scholars published textiles from museum collections (*e.g.* Shurinova 1968; Kakovkin 1978; 1988), investigated the iconographic motifs (Kakovkin 1978; 1988), attempted to reconstruct textile crafts of antiquity (Liapustin 1980; 1981) and their connection with the economy (Fechner 1973; 1996; Lubo-Lesnichenko 1994). Occasionally, attempts were made to investigate the textiles themselves, including their structure, fibre *etc.* (Novyts'ka 1948; Novitskaya 1960; Marchenko 1954; Golubkina 1971; Yeruslimskaya 1979; Davidan 1981; Mikolaichuk 1981; Rolle *et al.* 1998). At the same time, many works on the conservation of archaeological textiles were published and these often included the use of scientific methods in their investigation (Semenovich 1955; 1961; Moroz and Shumakova 1996), as in the case of the extraordinary finds from Sokolova Mohyla (Kovpanenko 1986; Elkina 1986; 1991).

After the independence of Ukraine, the interest in the study of archaeological textiles has increased, due in particular, to the growth of the number of textile finds recovered from archaeological sites, but also because of the need for a thorough investigation and interpretation of the material. Among the works on the archaeological textiles of Ukraine, of particular importance are the publications of Bredis (2001; Babenko *et al.* 2001), Mikhailov (2007), Shcherban (2007) and Krupa (see bibliography). Occasional attention has been paid to textile tools (Radziyevska 1979; Gavriliuk 1987; 1989). Scythian costume in particular has been investigated by Klochko (1979; 1991) and Yatsenko (2006).

Eneolithic

While no textiles dated to the Eneolithic period survive in Ukraine, numerous textile impressions on ceramics permit some general observations about textile production in this period. The earliest textile imprints are found on the bases of the Tripillia culture ceramics. According to Novyts'ka (1948; Novitskaya 1960), two types of textile materials can be observed among the imprints: those produced on a loom and those made by looping or netting. The most numerous among the first group are fabrics of rep weave with thread counts of 1–5 threads/cm in warp and 2–6 threads/cm in weft. The textiles of the second group have a density of 4 threads/cm in the warp and 4–6 threads/cm in the weft. There is also a unique imprint, which appears to have stripes woven by alternating tabby and rep. Tripolians probably used both wool and plant fibres (Novyts'ka 1948, vol. 2, 51–52). Palaeobotanical complexes of early Tripillia include hemp (*Cannabis* sp.) seeds (Yanushevich *et al.* 1993).

Bronze Age

Textiles dating to the Bronze Age are exceedingly rare in Ukraine but several examples survive to provide some information on fibres and techniques used in textile production of this period.

One of the earliest textile finds from Ukraine comes from the Sugokleya Kurhan (Kirovohrad region), belonging to the Yamna culture, *c.* 2500 BC (Gleba and Nikolova 2009; Nikolova and Keizer 2009). It is of great significance to our understanding of fibre technology in this

Site	Object	Thread thickness (mm)	Twist direction	Twist angle
Novoplatonivka (Kharkiv), kurhan 5, burial 2	braided cord 5mm wide on ceramic vessel	2	z	65
Novoplatonivka (Kharkiv), kurhan 8, burial 4	braided cord 4mm wide on ceramic vessel	1.5	s	65
Kolisnykivka II (Kharkiv), kurhan 3, burial 2	braided cord 4mm wide on ceramic vessel	0.2	s	65
Kolisnykivka II (Kharkiv), kurhan 4, burial 2	braided cord 3mm wide on ceramic vessel	1	z	85
Kolisnykivka II (Kharkiv), kurgan 8, burial 1	braided cord 3mm wide on ceramic vessel	2	S2z	70
Kolisnykivka II (Kharkiv), kurhan 9, burial 2	braided cord 2mm wide on ceramic vessel	2	Z2s	80
Kolisnykivka II (Kharkiv), kurhan 4, burial 2	braided cord 3mm wide on ceramic vessel	1	z	85
Okhrymivka I (Kharkiv), kurhan 1, burial 2	braided cord 4mm wide on ceramic vessel	2	s	65
Novyj Merchyk (Kharkiv), kurgan 1, burial 4	braided cord 3mm wide on ceramic vessel	2	S2z	80
Pysky Rad'kivs'ki (Kharkiv), 272/1-56	braided cord 3mm wide on ceramic vessel	1	-	-
Stanislavka (Kharkiv), kurhan 2, burial 6	plied cord on ceramic vessel	2	S2z	80

geographical area during the 3rd millennium BC and provides important comparative material to the contemporary textiles from the Eurasian steppe contexts in Russia (Shishlina 1999; Shishlina *et al.* 2000; 2002; 2003).

The remains of twisted fibre consisting of a thick cord about 2 cm long and 2S-plied were recovered from burial 24. Burial 5 yielded two fragments of dark brown fabric, which were found under the right foot of a man. Fragment A (Fig. 20.1 top), measures 5 × 3.3 cm, its thickness ranging between 0.3 and 0.5 cm. The threads are relatively coarse, measuring about 1 mm in thickness. Two–three layers of the fabric are discernible. The thread count in System 1 is 7–9 threads/cm, and the threads appear to have a slight z-twist. The thread count in system 2 is 6–7 threads/cm. The structure of the weave appears to be a slightly unbalanced tabby. It is not unlikely, however, that the fabric was in reality twined, like the smaller but better preserved fragment B (Fig. 20.1 bottom), which measures 3.1 × 2.3 cm and has a thickness of 0.5 cm. At least 4 layers are visible in this piece. Threads in both systems are about 1 mm thick and have a slight s-twist. System 1 has a thread count of 9 threads/cm. The thread count in system 2 is 4–5 threads/cm. Each two threads of system 1 are bent 180 degrees before crossing the threads of system 2. The technique of the weave is thus twining. However, because

there are no edges preserved, it is impossible to discern if it was warp or weft that was twined. Twined fabrics have been noted on other Yamna culture sites in Ukraine, *e.g.* two imprints of a cloth with twined warp appear on ceramic fragments from Dniprorudne in Zaporizhzhia region (Orfinskaya *et al.* 1999, 76 no. 25; Shishlina 1999, 48 Fig. 10.2; Shishlina *et al.* 2000, 113 Fig. 1).

While no definitive fibre identification is available, the appearance and coarseness of fibres suggest that all textile fragments found at Sugokleya may be of plant origin. Flax or hemp is likely in the case of the fragments found in Burial 5, while some sort of tree bast may have been utilised for the cord from Burial 24. It is impossible to determine the type of textiles the fragments from Sugokleya belonged to. They could have been parts of funerary shrouds or floor coverings. The fact that fragments A and B from Burial 5 have several layers indicates that they were folded before being deposited in the grave.

From the slightly later Catacomb culture, remains of a sack containing grain have been found at the feet of two buried individuals in burial 28, kurhan 14 in Bolotne, Crimea (Korpusova and Lyashko 1990). The sack, measuring 35×30 cm, was made of a textile folded in half although no edges survived. The textile was made in twining technique. One of the systems was made of rush (*Juncus* sp.) or

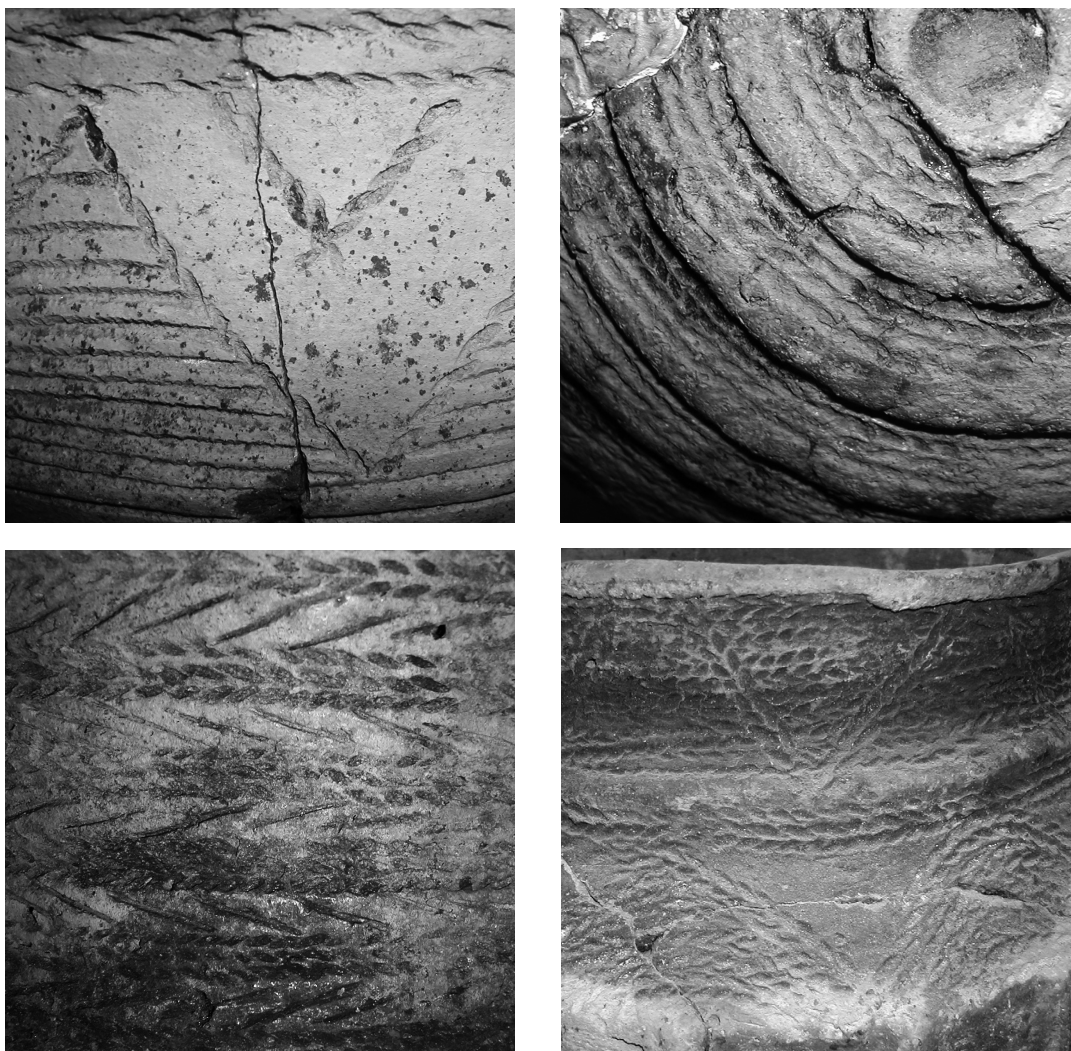
Table 20.1. Summary of technical data of cord imprints on the Bronze Age pottery of Ukraine.

Fig. 20.1. *Sugokeleya* Kurban, Kirovohrad region, Yamna culture, c. 2500 BC: top

– Fragment A; bottom
– Fragment B (Photo: M. Gleba).



Fig. 20.2. A selection of cord-decorated vessels, Bronze Age (Photo: T. Krupa).



sage (*Eleocharis* sp.) fibre, with threads s-twisted and plied and measuring 1 mm in diameter and a density of 4 threads/cm. The other system was made of feather grass (*Stipa* sp.), with single s-twisted threads measuring 3–4 mm in diameter and a density of only 2 threads/cm. The raw materials were obtained locally.

As in the case of the Eneolithic period, numerous textile imprints survive on ceramics of various Bronze Age cultures (cf. Žeiere in this volume). In particular, the vessels of the Catacomb culture are richly decorated using cords (Fig. 20.2). Many of the examples now in the collection of the Museum of Archaeology and Ethnography of Slobids'ka Ukraine at the Kharkiv University have been investigated using a methodology developed by Chernai (1985, 94). All the analysed cords were made of coarse fibres of unidentified origin. The results are summarised in Table 20.1.

Iron Age

Textile finds increase in frequency during the 1st millennium BC. These come mostly from rich Scythian, Sarmatian and Graeco-Roman burials, famous for their gold objects.

Scythian Period

In a kurhan of the Karavan group (Kharkiv region), dated to the second half of the 7th century BC, fragments of a wool textile and felt of a reddish-brown colour were preserved. The textile is woven of single s-twisted threads and has 11 threads/cm in the warp and 15 threads/cm in the weft. The textile fibre was dyed with alum-mordanted madder before spinning (Krupa 2000a).

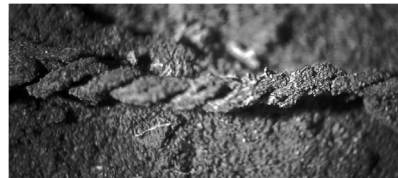
Among the excavated material found in the 5th-century BC Kurhan 1 of Heyevi Mohyly (Poltava region) are two textile fragments and two types of connecting thread (Krupa 2008). Textile 1 is a balanced tabby woven of single z-twisted yarn with a diameter of 0.5–0.6 mm, and a thread count of 8 threads/cm in both systems. The fibre is of plant origin. Textile 2 is an unbalanced tabby, woven of single s-twisted yarn with a diameter 0.7–1.1 mm (Fig. 20.3a). The thread count reaches 14 threads/cm in one system and 28 threads/cm in the other. The first connecting thread is made of S2z-plied with diameter 0.7–1 mm. The second connecting thread is also S2z-plied but is thicker, 1.8 mm (Fig. 20.3b).

A Scythian tomb of the 5th century BC excavated in Tumulus I at Nymphaion, Crimea, included numerous textile fragments now conserved in the Ashmolean Museum, Oxford (Liutsenko 1870; Wild 1978; Vickers 1999, 32 and Fig. 19; 2002, 24–25). Textile fragments from grave 1(b) included a fine wool weft-faced tabby (3 × 3 cm), with a thread count of 14/60–70, and a mass of loose strands of yarn, brown in colour (Vickers 2002, 24–25). The fibre has been analysed and is one of the few examples of fine wool from the 5th century BC (Ryder and Hedges 1973).

The 2002 investigations of Pereshchepyne kurhan cemetery (Poltava region) have resulted in the recovery of textiles from the 5th-century BC Kurhan 3, preserved on the surface of various metal objects, such as swords (Kulatova and Suprunenko 2003, 56). Several fragments are made of extremely fine fibre, possibly silk, and have high thread counts. Some fragments



a.



b.

Fig. 20.3. Kurhan 1, Heyevi Mohyly, Poltava region, 5th century BC: a) textile 2; b) connecting thread 2 (Photo: T. Krupa).

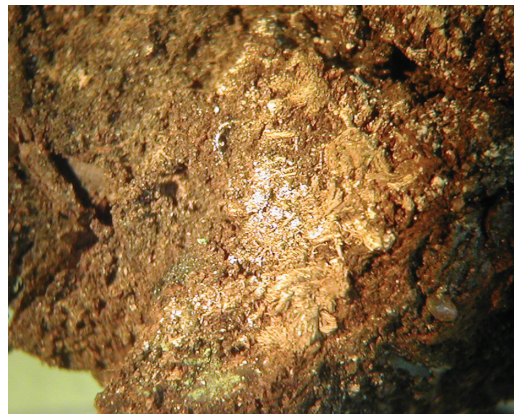
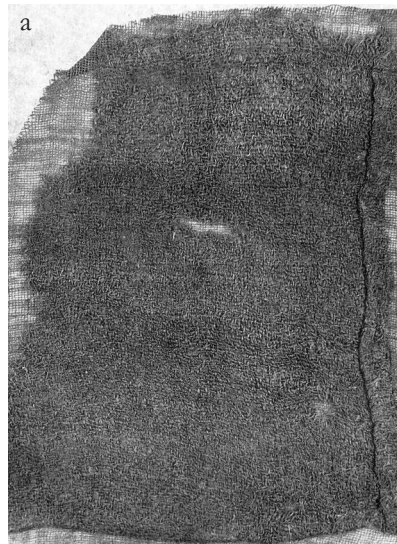
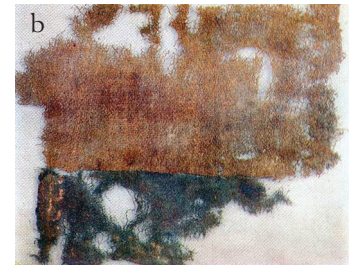


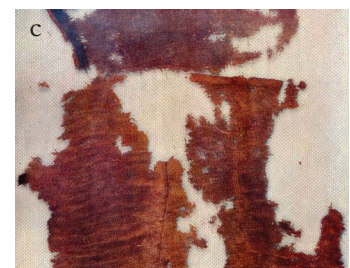
Fig. 20.4. Burial 1, Kurhan 25, Hryshkove, Kharkiv region, end of 5th–first half of 4th century BC (Photo: T. Krupa).



a



b



c

preserve traces of decoration in the shape of geometric motifs and flowers embroidered in various stitches.

In 2007, during the excavation of burial 1 in Kurhan 25 of Hryshkove cemetery (Kharkiv

Fig. 20.5. Textiles from Chortomlyk Kurhan, Dnipropetrovsk region, 4th century BC (After Alekseyev et al. 1991, Pls 37.1, 14.1–2).

region), was found an arrow case and an iron spear butt, dated to the end of the 5th–first half of the 4th century BC (Hrechko 2010). The objects were covered with mineralised textile fragments. The textile is a tabby woven of single z-twisted yarn with a hard twist angle and a thread diameter of 1 mm. The thread count is 8 threads/cm in one system and 10 threads/cm in the other. On one of the arrow cases, fragments were found of organic remains of a textile similar to that mineralised on the spear butt (Fig. 20.4), allowing identification of the fibre as fine white wool.

Mineralised textile remains from middle-late 4th century BC have been preserved on a Scythian lamellar cuirass, discovered in Kurhan 6 of the Pisochin (Kharkiv region) cemetery, discovered in 1978 and now in the collection of the Kharkiv Historical Museum (Babenko 2005). On the right side of the cuirass, the textile is a weft-faced tabby with 4 threads/cm in the warp and 14 threads/cm in the weft. Weft threads are Z-plied and 2.5 mm in diameter. The diameter of the warp yarn is about 1.5 mm. The left side of the cuirass preserves a different textile. It is a balanced tabby with 9 threads/cm in both systems and a thread diameter of 1 mm (Krupa 2005, 118–119).

In 2003, during the investigation of a burial site near Horodyshche (Kharkiv region), a bronze mirror with an iron handle was found, dated to the 4th century BC. It had mineralised fragments of a tabby with 7–8 threads/cm in both systems and a thread diameter of 1 mm (Krupa 2005, 119–120).

Numerous fragments of fabric have been recovered at the Royal Scythian kurhan of Chortomlyk (Dnipropetrovs'k region) dated to the 4th century BC (Fig. 20.5a–c; Rolle *et al.* 1998, 22–24). Nine wool fragments of diamond twill were preserved in their original red and green colours (Rolle *et al.* 1998, Cat. 127). Other fragments have preserved borders and striped patterns (Rolle *et al.* 1998, Cat. 120). One small textile fragment, possibly linen and now green from copper oxidation, has also been recovered (Rolle *et al.* 1998, Cat. 134). In addition, mineralised remains of a tabby were found on a bronze mirror (Rolle *et al.* 1998, Cat. 94). Some leather and felt fragments have been recovered as well.

Scythian period Kurhan Blyznet's 2 (Dnipropetrovs'k region) included materials

made of wood, textile and leather (Romashko and Skoryj 2009). Textile 1 was found in the pit in the floor (Fig. 20.6a). It is woven in a weft-faced tabby weave from single z-twisted yarn, with a hard spin and a diameter of 0.5 mm. The textile has 10 threads/cm in warp and 20 threads/cm in weft. The raw material is undyed white fine wool. Textile 2 was found in the fill of the chamber near the entrance (Fig. 20.6b) but was originally attached to the wooden burial chamber walls with small wooden pegs. The warp is made of single s-twisted yarn with a low twist angle and a diameter of 0.6 mm, while the weft is Z2s-plied yarn, 0.5 mm in diameter (Fig. 20.6c). The weave is a 2/1 twill, with the result being that the two sides of the textile have a different appearance. The material is undyed cotton. Both textiles appear to be imports: the fine wool possibly originated from the Near East, while the rare find of cotton indicates connections with Central Asia. In addition to the textile fragments, a leather fragment of complex construction was found in the inner pit. Its original function is unclear. The right side of the fragment is folded and gathered on a S2z-plied thread (1 mm thick) made of plant fibre, possibly hemp (Krupa 2009).

Another 4th-century BC burial, Vyshneva Mohyla (Burial 5, Zaporizhzhia region), allows a tentative reconstruction of the costume of an 8–9 year old Scythian girl (Fig. 20.7; Prilipko and Boltrik 1991, 26–30). The remains included fragments of wool and plant fibre textiles, fur and leather, and sewing threads indicating the tailoring of the garments. Some of the textile fragments were of very fine red and orange fabric that may have constituted the decorative elements of clothing. The reconstruction proposed by the excavators does not build on any of the garments known from iconographic sources but takes into account ethnographic evidence.

One of the most thoroughly analysed textile finds comes from the Velykyi Ryzhanivs'kyi Kurhan (Chercasy region), dated to the 4th–early 3rd century BC (Skoryj *et al.* 1999; Babenko *et al.* 2001; Bredis 2001). The female burial contained only few textile remains of a brown coloured textile, while the central male burial 2 included textile fragments found in the cauldron and on the floor, suggesting that these were not elements of clothing but rather some sort of shroud covering the tomb (Bredis 2001). Six different textiles have been

recovered, consisting of wool, plant (hemp, ramie), and mixed fibres. As far as techniques are concerned, there are fragments woven in plain weave and in twill, but one of the pieces is embroidered with an 8-petalled rosette in contouring stitch, and another possibly shows evidence of tapestry weaving (Fig. 20.8). The wool fibre diameter range is 6–45 micrometers.

Burial 2 in the 4th-century BC kurhan 4 at Besh-Oba, Crimea, contained tabby textile woven with s- and z-twisted threads. The ground textile has a yellow colour with green and red areas only on one surface, indicating that it was resist-dyed. The dyes were identified as madder for the red, weld for the yellow and woad and weld for the green (Krupa 2001b).

Kurhan 26 at Smila near Holodnyi Yar, Cherkasy region, dated to the 4th century BC, yielded a wool tabby with embroidery and remains of blue, red and yellow colours (Petrenko 1967, 29). A female burial from Tovsta Mohyla, Dnipropetrovs'k region contained a textile in a more complex weave, possibly samitum (Mozolevskij 1979, 206 Fig. 136).

Scythian period textiles are also known from imprints on ceramics. In contrast to textiles which are known only from the burial contexts, all vessels with textile imprints were found on settlements, mainly dated to the late 6th–early 4th centuries BC. On ceramics found in the forest-steppe sites on the left bank of the Dnipro River, imprints are predominantly present on the bases of the vessels and are rare on the sides (Shcherban' 2007). The imprints are probably connected to the ceramic production technology. Examples are known from Knyshivs'ke Horodyshe, Kam'yans'ke Horodyshe and the settlement on the Khortytsia Island. Textile imprints have also been noted on a rim of a large vessel from West Bils'ke Horodyshe; on a plate from Hlyns'ke Horodyshe and on a loom weight from East Bils'ke Horodyshe. All of the imprints are of tabbies, although in the nearby cemeteries, twill textiles have also been noted (Shramko 1987, 99). The majority of the textiles appear to be dense weft-faced tabbies with 9–11 threads/cm in warp and 14–20 thread/cm in weft. More open textiles are also noted, with thread counts of 6–8 threads/cm in warp and 7–12 threads/cm in weft (Shcherban' 2007, 87). In the vast majority of cases, evenly spun

single yarn was used, although occasionally, double weft was utilised. While in the case of the textiles imprinted on the ceramics it is difficult to determine their fibre, most likely they were of plant origin. In some cases (from Knyshivs'ke and Basovs'ke Horodyshe and the Dmitrenkiva Balka settlement), imprints of mats made of straw, lime and other bast fibres have been documented.

Sarmatian Period

The majority of Sarmatian textile finds belong to very rich burials and have been excavated in southern Ukraine and Crimea.

In 1974, a burial of a wealthy Sarmatian woman 45–50 years of age was excavated in Sokolova Mohyla on the Pivdennyj (Southern) Bug River, dated to the 1st century AD (Kovpanenko 1986). A vast quantity of gold appliqué (1218) was found scattered on and around her body, and their position allowed for a partial reconstruction of the dress (Fig. 20.9). Furthermore, around the area of the lower legs, were remains of textiles decorated with gold thread, preserved due to the presence of a piece of wood bark placed under the deceased's feet (Kovpanenko 1986, 20 Fig. 13). In addition, many fragments of thick gold threads, which supposedly decorated the funerary cloth, originally hung above the deceased, were found throughout the burial pit with higher concentrations near the walls. A piece of a fringe was found near the south wall (Kovpanenko 1986, 26). The textiles were examined by Elkina and the dyes were analysed by Golikov and Ustinov in 1986 (Elkina 1986; Elkina 1991).

Numerous fragments of the dress turned out to be Chinese silk dyed with Royal purple and embroidered with gold thread (Kovpanenko 1986, 46, Figs 46–48). The gold thread found in the Sokolova Mohyla burial was of three types, differing in thickness, spin direction and gold content, but all with a silk core. The thickest threads were found throughout the burial and probably formed a pattern on the funerary shroud. The medium and fine threads decorated the hem of the dress, and formed the decorative pattern of palmettes, diamonds, spirals, wave and triglyph motifs, which were composed before being sewn onto the silk textile. Each element has a contour made in gold thread (Fig. 20.10a). The

fine threads with the highest gold content were used for the figural decoration. Regrettably, only the smallest fragments survive depicting a column capital, a floral spiral of an acanthus leaf and an olive branch, all executed with the same contouring technique (Fig. 20.10b). The elemental composition analysis demonstrated that the threads are composed of almost 100%

gold. Silver threads with a silk core were also found among the remains but they were highly degraded.

In kurhan 3 at Svatova Luchka (Luhans'k region), a woman's burial dated to *c.* the 1st century BC, contained purple-coloured textile remains decorated with gold appliqué in the chest area and in-woven with flat gold threads at the hem (Shramko 1962, 243). Gold threads found near the woman's feet supposedly decorated her shoes.

The rich female burial 18 excavated in kurhan 5 at the Sarmatian site of Nogaichik in Crimea dated to the 1st century BC–1st century AD, yielded a silver-gilt cup which contained scraps of two types of silk fabrics. Their position near the right wrist indicates that they may have belonged to the sleeve of a dress (Mordvintseva and Zaitsev 2003, 202). Textile analysis demonstrated that the first silk fragment is a tabby with a thread count of 50/60 threads/cm. The threads are unspun, with the warp measuring 0.4–0.5 mm in diameter, and the weft 0.7 mm. The second fragment is a gauzy tabby with a thread count of 70/70 threads/cm; the threads are also unspun, 0.2 mm in diameter. Furthermore, the outer surface of the lid of a wooden sarcophagus in which the deceased was placed, was probably covered with a large piece of cloth, onto which gold figural plaques had been attached in various patterns – their distribution in the tomb in a shape of a rough triangle is the only indication of the original presence of the cloth (Mordvintseva and Zaitsev 2003, 200).

The late Sarmatian cemetery of Ust'-Al'ma, Crimea, yielded abundant textile finds, of which 23 samples (including 2 gold thread finds) have been investigated to date (Loboda *et al.* 2002; Krupa 2007). The majority of textiles are made of wool, but some fragments of plant or mixed material have also been noted. One silk textile was found in burial 2 of burial chamber 620. The textiles were woven of single yarn in both s and z twist, except for the textile from burial chamber 736, which was woven with double yarn. The silk threads from burial Chamber 620 have no twist and consist of 3–4 flat fibres. Such untwisted silk threads are also known from other textiles discovered in the northern Black Sea region (Elkina 1991, 228).

All the textiles are woven in tabby weave and vary only in density. Both very open and closed weaves are noted. Thus, burial chamber

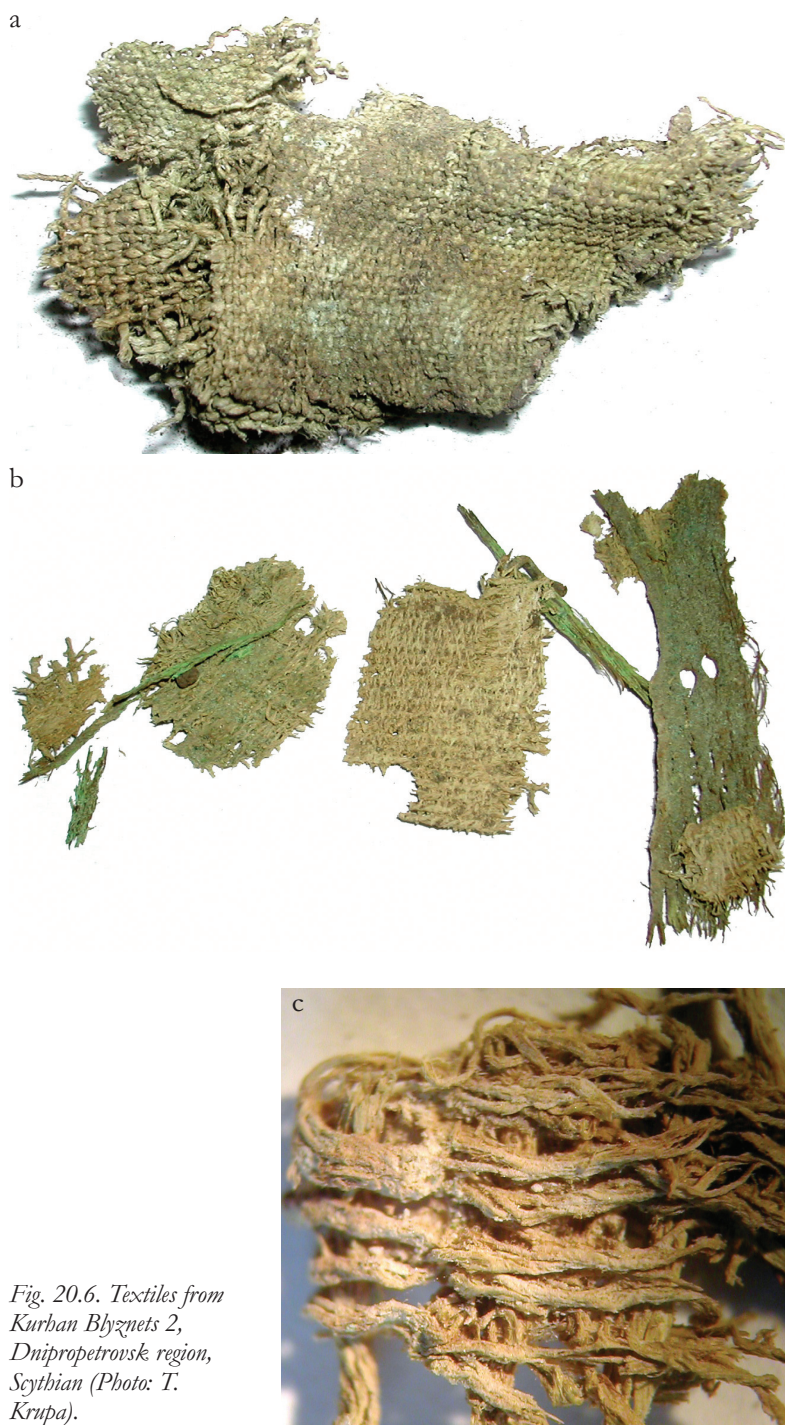


Fig. 20.6. Textiles from Kurban Blyznets 2, Dnipropetrovsk region, Scythian (Photo: T. Krupa).

736 yielded a very open weave (Fig. 20.11a–b) made of a fine yarn (0.5–0.7 mm in diameter) with low twist and 11 threads/cm in both systems, and a dense tabby (Fig. 20.11c) with 16 threads/cm in both systems, which had a fine low-twist warp (0.3–0.5 cm in diameter) and a thicker plied weft (1 mm in diameter).

The majority of the Ust'-Al'ma textiles are monochrome, ranging from red to reddish-brown to brown hues. The garment from the female burial 1 in burial chamber 620 was decorated with parallel lines, consisting of single blue threads woven in every centimetre, although it is unclear if the lines occur in the warp of weft direction (Loboda *et al.* 2002, 319).

The microscopic examination of the dyed samples demonstrated that the yarn had a very homogeneous colour, indicating dyeing of the raw wool. Dye analyses further demonstrated that the majority of textiles were dyed with madder. Both alum and iron were used as mordants in order to achieve red and brown-black colours respectively. The silk from burial 2 in burial chamber 620 was dyed with true purple, while blue threads from burial 1 in the same chamber tested positive for indigotin. Textiles from burial 14 of burial chamber 520 and the top layer of burial chamber 736 were dyed yellow, possibly using weld.

Gold thread with gold and silver strip twisted around some sort of organic core, possibly animal gut, was recovered from male burial 2 in burial chamber 620 and the female burial in burial chamber 612 (Krupa 2000b, 119). The latter example preserves the shape of a gold thread element 1.4×0.3 cm, which was most likely sewn onto a garment (Fig. 20.12). The elemental composition analysis demonstrated that the threads are composed of almost 100% gold.

In 1991, six grey-coloured textile fragments consisting of both coarse wool and plant fibre were excavated in 3rd–4th century AD burials at Kilen-Balka, near Sevastopol' in Crimea. The thread count is approximately 12/14 threads/cm.

Northern Black Sea Greek and Roman Colonies

The majority of textile finds from the colonial contexts have been found in the eastern Crimea. Fragments of a textile embroidered

with gold were found as early as 1872 in a 3rd-century BC burial mound near the Greek site of Pantikapaion, modern Kerch (Stephani 1881, 135–136, pl. V, no. 4; Minns 1913, 336; Rostovtsev 1925, 223). A cloth from a lead sarcophagus containing a woman was originally purple rep wool embroidered with gold threads creating an ivy garland pattern (*cf.* Alfaro, Spantidaki and Moulherat in this volume). Three fragments of this textile were recorded in 1973 (Gertsiger 1973, 96 no. 32). Stephani, who in 1881 first published these and many other textile fragments found in ancient burials of southern Ukraine, mentions in a footnote that large quantities of gold threads of similar quality have been found, although in most cases the organic elements of the textiles have disappeared (Stephani 1881, 136).

Other finds from Pantikapaion include several small silk fragments with a lozenge pattern (BM48.8–4.67) now in the collection of the British Museum (Fig. 20.13; Granger-Taylor and Wild 1981). System 1 (probably warp) is unspun with 38–40 threads/cm, system 2 (probably weft) is unspun, with 28–30 threads/cm and 0.2 mm in diameter. Very similar silk fragments, now in the Hermitage Museum (P.1842.83) were reported to have been found in 1842 in a stone-lined chamber-tomb of the 1st century AD at Hlynyshe, west of Kerch (Stephani 1881, 134, pl. V no. 3; Lubo-Lesnichenko 1961, 29; Gertsiger 1973, 83, 95 no. 28). Their thread count and details of weaves are remarkably similar to the pieces at the British Museum, indicating that all these fragments are parts of the same textile, which contained the cremated bones of possibly a woman deposited in an urn covered with a silver lid and placed in a wooden coffin. It also reportedly contained remains of violet cloth with fur lining. The silk textile has been identified as monochrome figured silk of Han Chinese origin and date, making it the first textile from the western world to be recognised as Chinese silk (Granger-Taylor and Wild 1981). Additional finds from Hlynyshe, Mitridat Hora and Karantynna Hora, all also from Kerch and dated to the 1st century BC–1st century AD were noted by Gertsiger (1973, 81–83, 90–94 nos. 7–21). They are summarised in Table 20.2.

Pavlovskij kurgan, dated to the 4 century BC and located 5 km south of Kerch in the Yuz-Oba cemetery, contained fragments of embroidered cloth among the bones of a



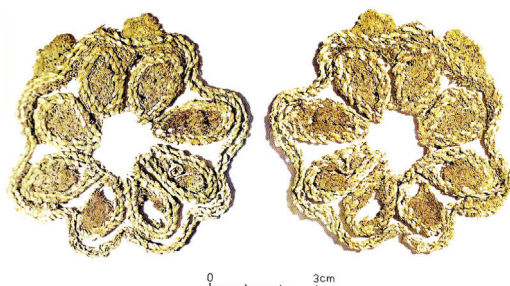
Fig. 20.7. Reconstruction of Scythian girl's costume based on textile finds from Burial 5, Vishneva Mohyla, Zaporizhia region, 4th century BC (After Prilipko and Boltrik 1991, Fig. 7).

Fig. 20.8. Flower-shaped textile decoration from Velykyi Ryzhanivsk'kyi Kurhan, Chercasy region, 4th–early 3rd century BC (Courtesy of Sergei Skoryi).

Fig. 20.9. Schematic illustration of the burial at Sokolova Mohyla, Mykolaiv region, 1st century AD, showing distribution of gold plaques and other decorative elements (After Kovpanenko 1986, fig. 119).

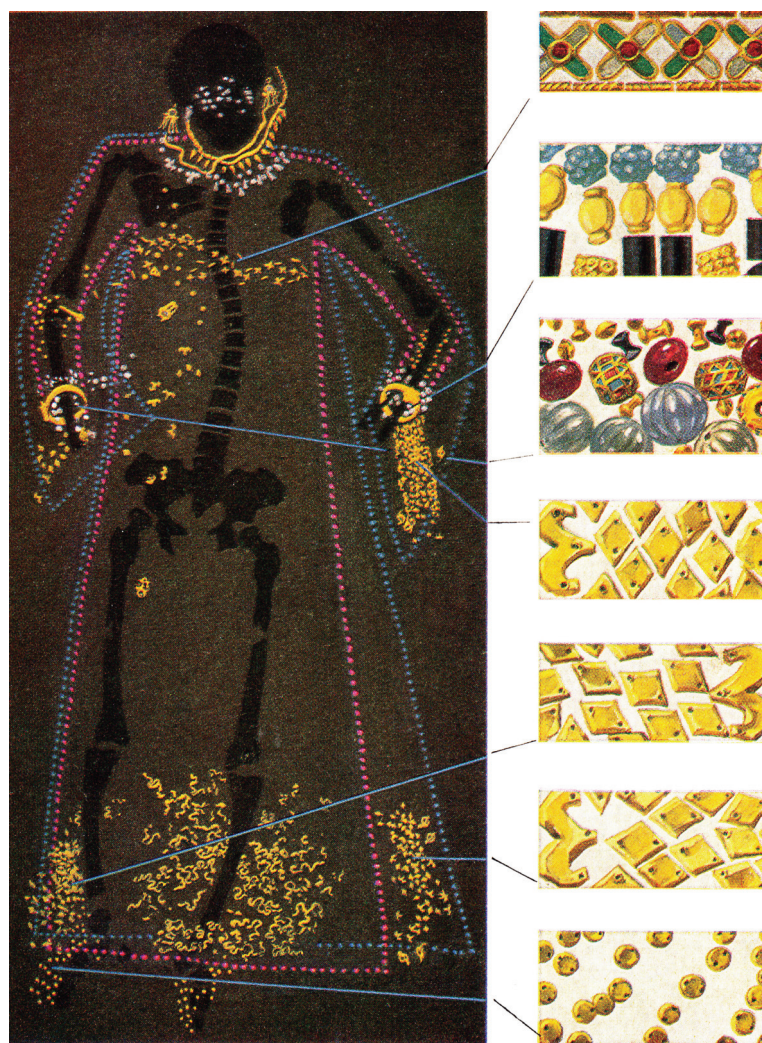
woman buried in a sarcophagus (Gertsiger 1973, 80–81, 90 no 5; Barber 1991, 207–209). The polychrome motifs include a rider on a horse.

In western Crimea, a small fragment of gold-woven brocade was found in a Roman period burial at the ancient site of Chersonesos located in the territory of present-day Sevastopol' (Kryshtal and Krupa 2006).



The two-ply gold thread of animal gut core, wrapped with a strip of 80% gold. The strip is s-twisted and only 1.8 microns thick. Two more finds of gold thread from Chersonesos are known from the early 20th-century excavations and date to the first centuries AD. Thus, the 1908 excavations in Chersonesos yielded a piece of gold brocade forming a geometric diamond pattern; here, a gold strip was twisted around a silk core. Another find, from Devichya Gora, is a gold brocade woven with threads of gold strip twisted around animal gut (Krupa 2000b, 119).

The Römisch-Germanisches Museum, Cologne, Germany possesses several textile fragments allegedly found in a pit in the Greek colony of Olbia and acquired by the museum in 1943 (Lise Bender Jørgensen, pers. comm. 2006). The fragments (RGM 43,80) include a fine brown tabby, probably wool, z/z twisted



yarn with a thread count of 56/17 threads/cm; a violet tabby, z/z, with 56/20 threads/cm; a rep-like basket weave, zz/zz, with 56x2/16x2 threads/cm; and a 2/1 twill, S2z/S2z, with 42/11 threads/cm, decorated with stripes. Although the exact context of these textiles is unknown, they could date to the Roman period.

Taman Peninsula

Although geographically not part of modern Ukraine, the Taman Peninsula formed an integral part of the Black Sea colonial sphere during the Graeco-Roman period. Therefore, some of the major finds from this area are included here. Kurgan 4 at Seven Brothers/Semibratniye Kurgany opposite Kerch, dated



Fig. 20.10. Gold embroidery from Sokolova Mohyla, Mykolaiv region, 1st century AD: top – fragment NVF-194; bottom – fragment NVF-199 (Photo: M. Gleba, with permission of the Museum of Historical Treasures of Ukraine, Kiev).

Gettsiger 1973 cat. no.	Site	Date	No. frag.	Weave	Fibre	Thread count	Decoration
1	Taman, Seven Brothers k. IV	5th c. BC	20	tabby	wool	16/21	resist-painted; black background with red and brown pattern
2	Taman, Seven Brothers k. IV	5th c. BC	1	tabby	linen	14/8	-
3	Taman, Seven Brothers k. VI	4th c. BC	50	tabby	wool	20/28	resist-painted; black background with polychrome patterns
4	Taman, Seven Brothers k. VI	4th c. BC	3	tapestry	wool	28/50	polychrome duck pattern on red background; fragment of fur attached
5	Kerch, Pavlovskij kurgan b. 2	4th c. BC	7	tabby	wool	21/24	red with polychrome embroidery
6	Kerch, Ak-Burun	4th c. BC	20	rep	plant?	3/10	very coarse warp
7	Kerch, Mitridat b. 40	1st c. BC	4	tapestry	wool	12/33	green, brown and yellow colours
8	Kerch, Karantinnaya gora b. 1	1st c. AD	4	tabby	wool	11/12	brown colour
8	Kerch, Karantinnaya gora b. 1	1st c. AD	1	rep	wool	18/28	brown colour
9	Kerch, Karantinnaya gora b. 1		1	weft-faced tabby	wool	14/21	brown colour; nap
10	Kerch, Karantinnaya gora b. 1	1st c. AD	1	tabby	wool	30/30	brown colour; nap
11	Kerch, Mitridat no. 4	1st c. AD	1	weft-faced tabby	wool	23/28	brown and red stripes on black background
12	Kerch, Mitridat no. 2	1st c. AD	1	rep	wool	10/24	brown, green, yellow stripes on red background
12	Kerch, Mitridat no. 2	1st c. AD	1	weft-faced tabby	wool	17/23	reddish-brown colour
12	Kerch, Mitridat no. 2	1st c. AD	2	rep	wool	8/16	brown colour
12	Kerch, Mitridat no. 2	1st c. AD	1	?	wool	?	greenish-brown colour
13	Kerch, Glinishche	1st c. AD	15+	tabby	wool	16/18	stripes
14	Kerch, Glinishche		2	tapestry	wool	14/35	stripes with geometric and floral motifs
15	Kerch, Glinishche	1st c. AD	1	rep	wool	15/32	green and brown stripes, nap
16	Kerch, Glinishche	1st c. AD	4	tapestry	wool	11/19	black and yellow ornament on brown background
17	Kerch, Glinishche	1st c. AD	3	weft-faced tabby	wool	12/20	brown colour
18	Kerch, Glinishche	1st c. AD	1	weft-faced tabby	wool	15/24	brown colour
19	Kerch, Glinishche	1st c. AD	5	weft-faced tabby	wool	15/24	brown colour

20	Kerch, Glinishche	1st c. AD	2	weft-faced tabby	wool	10/15	light stripes on brown background
21	Kerch, Glinishche	1st c. AD	7	weft-faced tabby	wool	16/23	dark brown stripes on light background
22	Kerch	1st c. AD?	4	weft-faced tabby	tapestry	20/28	green stripes with yellow floral motifs on red background
23	Kerch	1st c. AD	1	tabby	wool	22/20	rep border
24	Kerch, Abdul-Kerim	1st–2nd c. AD	1	tabby	wool	18/20	light brown colour
25	Kerch, Abdul-Kerim	1st–2nd c. AD	1	tabby	wool	40/42	dark brown colour
26	Kerch, Abdul-Kerim	1st–2nd c. AD	2	tabby	wool	?	reddish-brown colour
27	Kerch, Abdul-Kerim	1st–2nd c. AD	1	weft-faced tabby	wool	16/20	light warp and light weft
28	Kerch kurgan no. 3	1st–2nd c. AD	3	compound tabby/twill	silk	30/36	diamond pattern, gold-yellow colour
29	Kerch, Glinishche	1st–2nd c. AD	2	weft-faced tabby	wool	20/26	brown colour
30	Kerch	2nd–3rd c. AD	7	brocade	wool	6/17	geometric pattern
31	Kerch	2nd–3rd c. AD	7	brocade	wool	6/17	geometric pattern, black, brown and red colours
32	Kerch	3rd c. AD	3	rep	wool, gold thread	15/?	red colour; embroidery with gold thread
33	Sur-Tash	3rd–4th c. AD	1	tabby	linen	27/29	inscribed in black paint
34	Taman no. 27	4th c. AD	3	felt hat	camel?	na	light brown colour
35	Taman no. 27	4th c. AD	1	rep	wool	12/22	orange stripes on brown background; fringes
36	Kerch	?	1	tapestry	wool	11/20	floral pattern
37	Kerch		1	warp-faced tabby	wool	21/13	light brown colour

to the 5th century BC, yielded a coarse linen textile and an interesting piece of resist-dyed wool tabby (Fig. 20.14; Barber 1991, 206–209). A sarcophagus cover from the later kurgan 6 at the same site was also resist-dyed with friezes depicting Greek mythological figures. The same burial also yielded pieces of delicate tapestry with polychrome birds on a red background that must have formed part of the funeral clothing (Stephani 1881, 119–124; Gertsiger 1973, 72–80, 88–89 nos. 1–4; 1975).

Raw Materials

Due to the variety and mobility of the various cultures that have occupied the territory of

Ukraine since prehistoric times, its textile finds present an extraordinary variety of raw materials. The earliest finds are made of plant fibres, in most cases hemp. The ancient historian Herodotos associates the use of hemp with Scythian populations, who called it *kana* (Hrdt. IV, 74). Hemp was used for making textiles already during the Neolithic and by the Scythian Period was probably even cultivated for the purpose. Tree bast, ramie and various grasses were also in use early on. Flax is common by the 1st millennium BC, but may have been in use already during the Neolithic. Examples of cotton have been identified among the finds for the Scythian Blyznets 2 kurhan. Cotton is also attested in

Table 20.2. Summary of technical data of textiles from the Black Sea area of Ukraine published by Gertsiger (1973).

Fig. 20.11. Burial chamber 736, Ust'-Alma, Crimea, 3rd–4th centuries AD: a) textile; b) close-up of the dark part; c) close-up of the light part (Photo: T. Krupa).

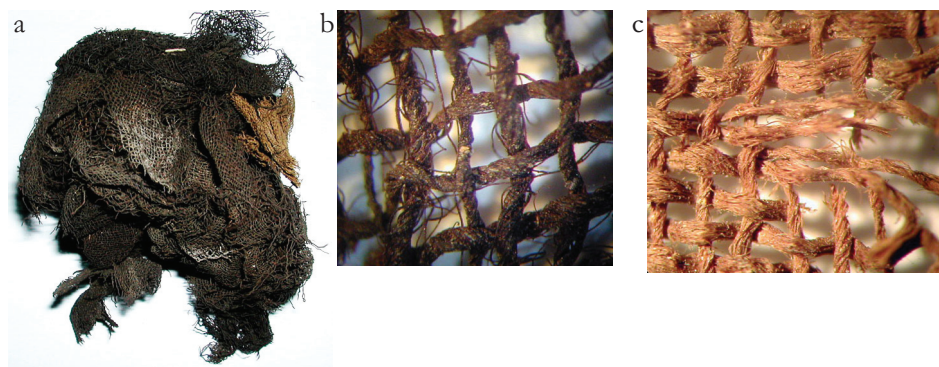


Fig. 20.12. Burial chamber 612, Ust'-Alma, Crimea, 3rd–4th centuries AD: above – gold thread; below – SEM image of the gold thread (Photo: T. Krupa).



Fig. 20.13. (opposite top) Silk, possibly from Hlynysbche, west of Kerch, Crimea, 1st century AD (Courtesy of The British Museum).

Fig. 20.14. (opposite bottom) Drawing of the resist-dyed textile with figural decoration from Kurgan 4 at Seven Brothers/Semibratniye Kurgany, Taman Peninsula, Russia, 5th century BC (After Stephani 1881, Pl. IV).

the frozen Scythian burials of Altai (Polosmak and Barkova 2005, 42).

Although previously it was believed that the use of wool in the western parts of Eurasia started only in the second half of the 3rd millennium BC, there is evidence that fibres of animal origin were available to the populations of Ukraine and the greater Eurasian zone even earlier (Orfinskaya, Golikov and Shishlina 1999). Thus, among the Caucasian Majkop culture textiles of the 4th millennium BC, wool fibres were identified (Shishlina, Orfinskaya and Golikov 2003). The majority of the surviving textiles from the Scythian period are made of wool. Very fine qualities of wool were available to at least some members of the society (Ryder and Hedges 1973), although scholars generally agree that such fine wools were imported to the area.

Fine goat underwool was also occasionally utilised, as attested by the textile found in Haimanova Mohyla (Sergei Polin, pers. comm. 2005). Camel hair was identified in one of the burials in Taman (Gertsiger 1973). This also probably arrived through long distance trade. Examples of camel hair mixed into sheep wool textiles and felts are known from the Siberian burials in Pazyryk (Polosmak and Barkova 2005, 35).

Graeco-Roman and particularly Sarmatian burials found in the northern Black Sea area yielded numerous examples of silk textiles, including the first textile from the western world to be recognised as Chinese silk (Granger Taylor and Wild 1981). Silk finds are particularly numerous in Sarmatian burials such as Sokolova Mohyla, Ust'-Al'ma and Nogaichik, and Graeco-Roman burials of Kerch and Chersonesos. It is likely that Scythians and Sarmatians played an important role in the early silk trade (Jäger 2007).

Many of the surviving Scythian and Sarmatian textile finds are brightly coloured, as in the case of the Chrotomlyk pieces (Rolle *et al.* 1998). Madder dyes mordanted with alum and/or iron have been identified at the 7th-century Karavan kurhan, the 4th-century kurhan at Besh-Oba in Crimea (Krupa 2001b) and Sarmatian Ust'-Al'ma. Indigotin and various yellow dye components are also frequent finds, *e.g.* at Ust'-Al'ma. The use of woad is mentioned in a 6th-century BC lead tablet found in the agora of Olbia (Vinogradov 1998, 158). Kermes and safflower dyed textiles have been identified in the Sarmatian burial of Sokolova Mohyla (Golikov and Ustinov 1986). True shellfish purple has been identified in finds from Sarmatian Sokolova Mohyla and Ust'-Al'ma, in association with silk and gold thread (*cf.* Spantidaki and Moulherat, Gleba in this volume).

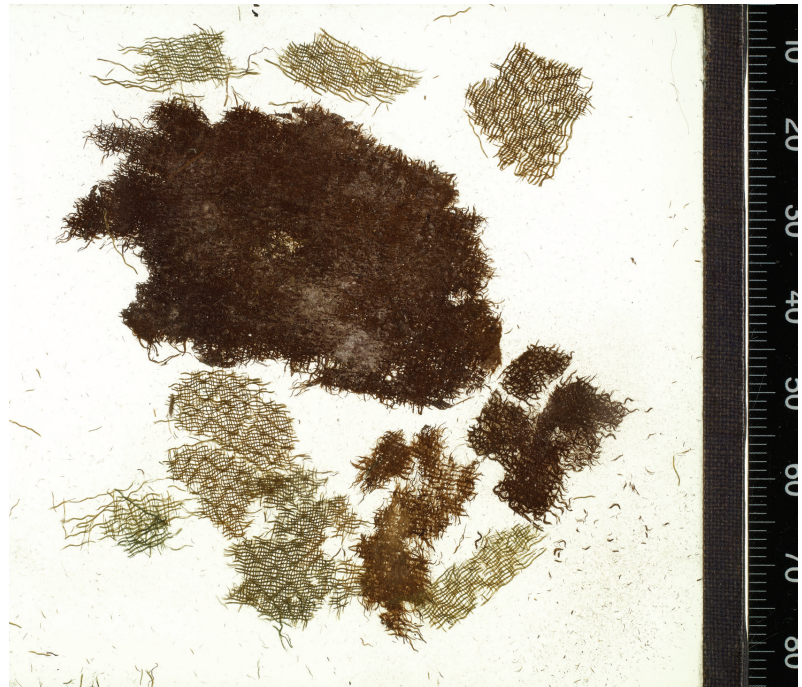
As early as the Bronze Age, gold was exploited for the adornment of clothes. The use of gold plaques on costumes is particularly well documented by the assemblages recovered from Scythian and Sarmatian burials in Ukraine. Scythians may have adopted the custom during their incursions into Persia in the 7th century BC. The garments of wealthy Scythians, in fact, have been primarily reconstructed on the basis of the distribution of such golden ornaments in burials (Klochko 1979; 1991). From the Hellenistic period onwards, the use of gold thread is documented in rich burials in the Graeco-Roman colonies and those of the Scythian/Sarmatian elite. The gold thread is usually made by twisting a strip of gold around some sort of organic core. Threads recovered from the Chersonesos and Sokolova Mohyla (Elkina 1986) burials had a silk core, while gold strips from the Sarmatian burials of Ust'-Al'ma were wrapped around animal gut (Krupa 2000b).

In some cases, leather, skin and fur fragments have survived in burials, as at Chortomlyk, Blyznets 2 kurhan, Vyshneva Mohyla. These materials constitute an important element of dress of the various prehistoric cultures of Ukraine.

Textile Techniques

The earliest textile evidence in Ukraine indicates that, already during the Eneolithic, the local populations were spinning yarn and weaving textiles, as well as utilising techniques such as twining and looping. Both s- and z-twisted yarns were spun. The use of the twining technique continues into the Bronze Age, but the material is too limited to draw any more general conclusions for this period.

It is only in the 1st millennium BC that the evidence becomes more abundant. Scythian textiles are made primarily of single yarn, both s- and z-twisted. Tabby is a predominant weave, often being weft-faced, with low to medium thread counts, but more complex techniques also make their appearance. Twills have been found in Blyznets' 2, Chortomlyk and Velykyi Ryzhanivs'kyi Kurhan. Coloured patterns, such as stripes have been noted at Chortomlyk. Tapestry is noted at Velykyi Ryzhanivs'kyi Kurhan. Spectacular examples of tapestry are documented on contemporaneous Greek sites in Kerch and on the Taman Peninsula.



Embroidered decoration was found on textiles from Velykyi Ryzhanivs'kyi Kurhan kurhan and the Pereshchepyne cemetery while evidence of tailoring and sewing comes from Vyshneva Mohyla. Felt is present among the earliest Scythian finds, from Karavan kurhan and Chortomlyk, and in later material, such as Kerch (Gertsiger 1973, 97 no. 34). Examples of resist-dyed textiles are known from Besh-Oba and Taman Peninsula.

The thread counts increase dramatically and the more complex decorative techniques become particularly common during the Sarmatian and Roman periods. Striped textiles are known from Ust'-Al'ma, Olbia and Kerch. Gold brocade is known from Roman burials in Kerch and Chersonesos, and gold thread embroidery is documented in Sokolova Mohyla, Svatova Luchka, Ust'-Al'ma, Kerch and Pavlovskij kurgan on Taman. During the Sarmatian period, figured Chinese silks reach southern Ukraine, adding to the variety of complex textiles.

Textile Tools

The information on textile tools is scarce, mostly because of the lack of interest on the part of excavators, but some examples give an indication of technologies used in textile production throughout the various periods.

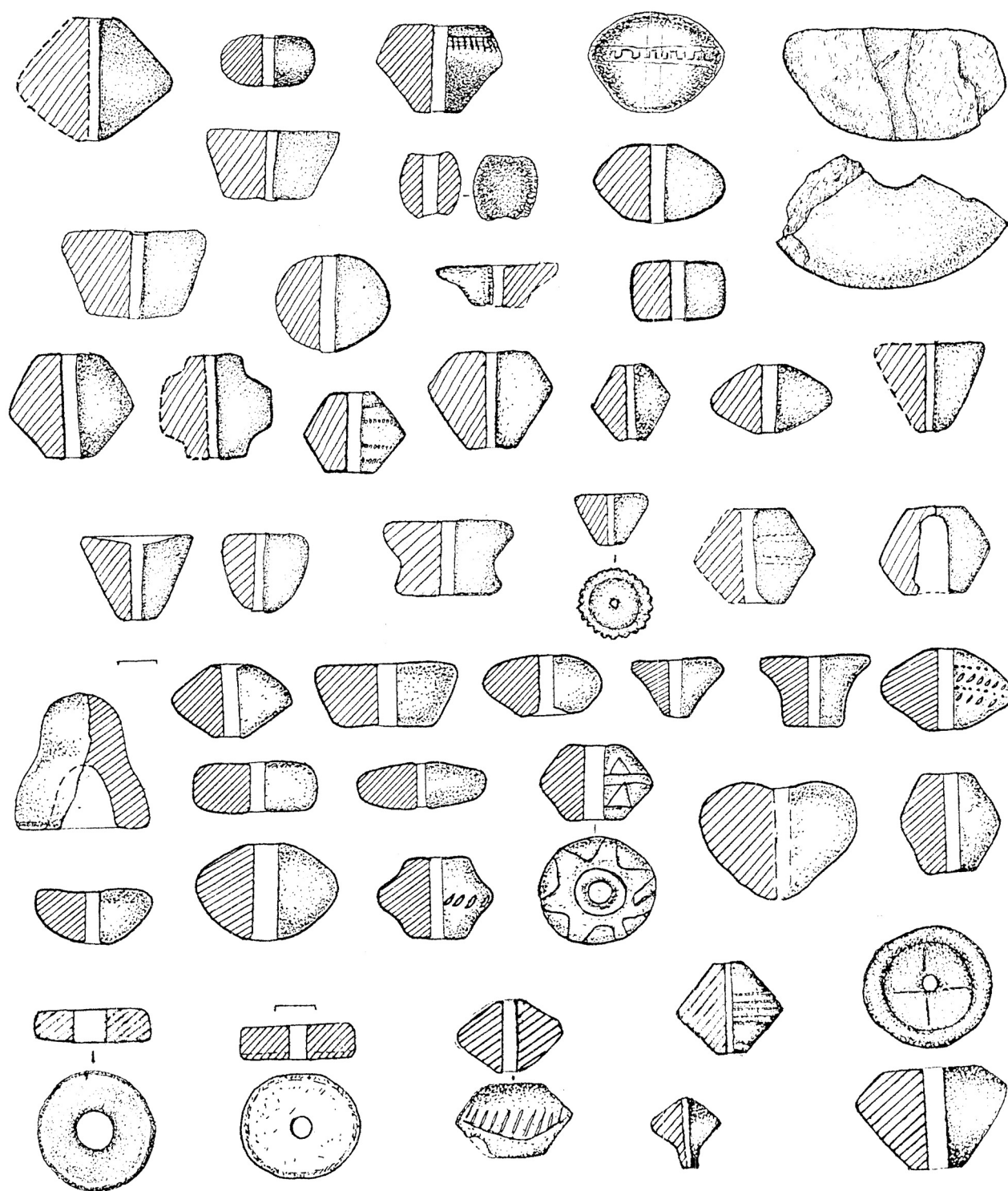
Spinning is attested by ceramic spindle whorls, which are known on the territory of Ukraine from the Neolithic onwards. They are systematically found on all Srubna culture settlements, although generally not in numerous quantities (Polidovich and Polidovich 1999, 217). They come in conical, biconical, hemispherical, spherical and cylindrical shapes (Fig. 20.15). Spindle whorls are rare in burials, but when present, they are usually found together with awls and needles. The situation changes significantly during the Scythian period, when spindle whorls become much more common, first in the forest-steppe region of Ukraine, but by the 5th–4th centuries BC also in the steppe zone. Spindle whorls are very numerous on all Scythian settlement sites (Radziyevska 1979; Gavriliuk 1987; 1989, 85–89). The settlement of Bils'ke Horodyshche, dated to the 7th–3rd centuries BC, yielded over 400 whorls of 17 types from the eastern rampart alone (Yakovenko 1991, 112). At the same

time, they become ubiquitous in female burials (Gavriliuk 1987, 119). In the steppe regions, lead spindle whorls are relatively common (Gavriliuk 1987, 121–122). The average weight of spindle whorls found in various burials is 16–22 g, and their average diameter 2–2.8 cm (Gavriliuk 1987, *passim*). This increase in the numbers of spindle whorls is probably connected to cultural transformations, *i.e.* the switch to pastoral nomadism and the significant increase in the percentage of ovicaprids. At Bils'ke Horodyshche, for example, 50% of faunal remains consist of sheep bones, while at Motronyns'ke Horodyshche ovicaprids constitute approximately 30% of animal bones (Sekerskaya 2001). The increase in spinning may also be connected with the wider use and cultivation of plant fibres such as flax and hemp.

During the 4th century BC, composite spindles made of bone or luxury materials such as silver appear in burials (Gavriliuk 1987, 123–124; Mozolevskiy and Polin 2005, 355), *e.g.* the bone example from Soboleva Mohyla (Fig. 20.16; Mozolevskiy and Polin 2005, 355) or the bone, silver and gold spindle from Chortomlyk (Rolle *et al.* 1998, 22 no. 119, pl. 36.2). They probably carried symbolic meaning, although they most likely were based on functional prototypes (*cf.* Gleba in this volume).

Loom weights appear by the time of the Cucuteni-Tripilia culture, when the agricultural way of life led to the creation of permanent settlements. Clay weights of various shapes are known as far east as Kiev (Barber 1991, 98). In the following periods, with the gradual shift to a more nomadic way of life, there is little evidence of the use of the warp-weighted loom. It is more likely that some sort of portable band loom was in use. During the Scythian period, while loom weights are common in the Greek colonies, they are practically absent from the Scythian sites (Nosova 2005), suggesting that the warp-weighted loom was a Greek introduction. The type of loom used by the Scythian populations is unknown, but frequent finds of twills indicate that it had several heddle bars.

Spools have been frequently noted on the Early Iron Age Zhabotyn settlement in northern Ukraine (Daragan 2004, 100–120, Fig. 40.4–8), as well as on Scythian sites, such as Motronyns'ke Horodyshche (Fig. 20.17; Bessonova and Skoryi 2001). They are of a



size and shape similar to the contemporaneous Italian examples (*cf.* Gleba, Ræder Knudsen in this volume), but it is not known whether they served the same function, as no examples of tablet-woven textiles have been identified in Ukraine to date.

Bronze and iron needles have been found in female burials, often in association with other textile tools such as spindle whorls (Gavriliuk 1987, 125–126). They are 3–7 cm long and 2–4 mm in diameter.

The use of felt is indicated by some finds,

Fig. 20.15.
Spindle whorls
from Motronyns'ke
Horodyshe (After
Bessonova and Skoryi
2001, Fig. 56).

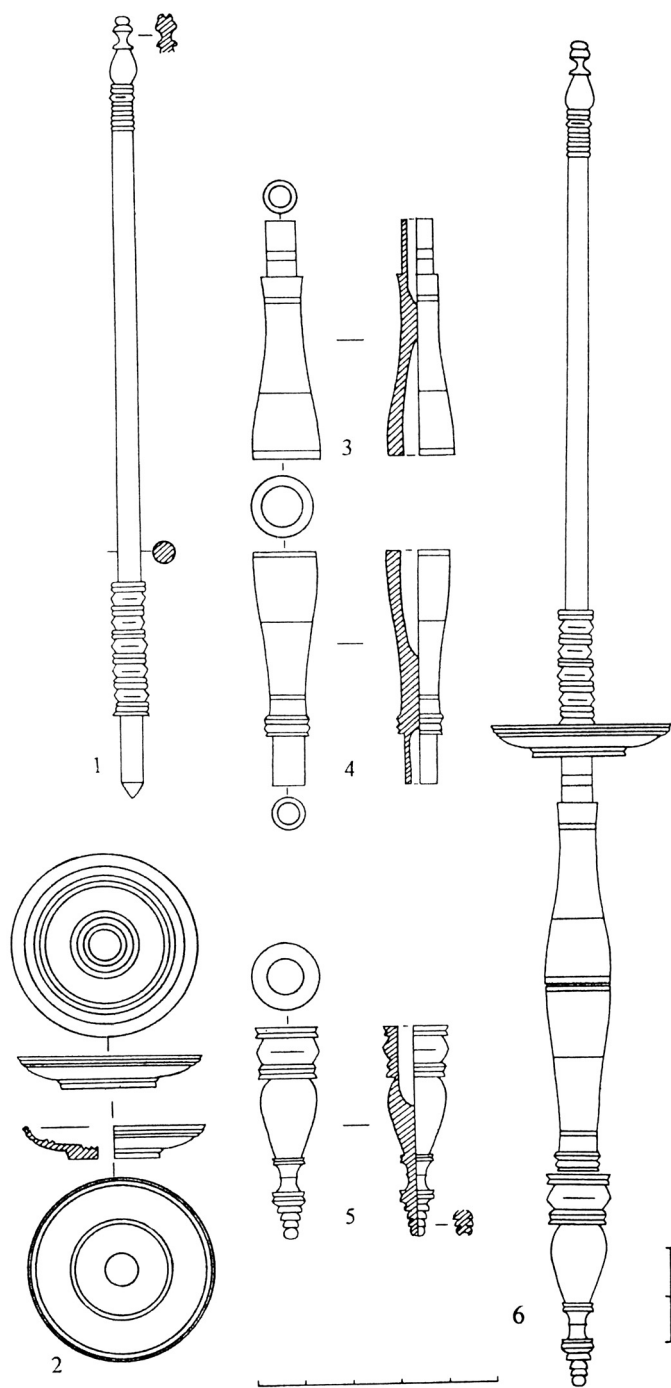


Fig. 20.16. Composite bone spindle from Burial 2, Soboleva Mohyla, 4th century BC (After Mozolevskij and Polin 2005, 167 Fig. 97).

e.g. Karavan group kurgan (Krupa 2000a) and Chortomlyk (Rolle *et al.* 1998). Altai finds indicate that felt was an important material for Asian Scythians and its production achieved a very high technological level (Polosmak and Barkova 2005, *passim*).

Textile Function

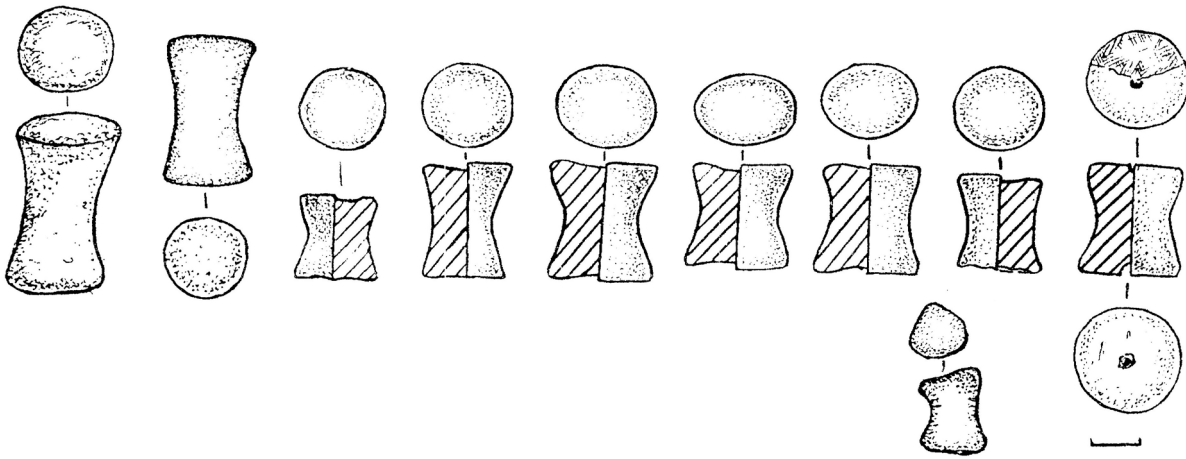
The vast majority of the preserved textiles of Ukraine probably formed a part of clothing. While most of them are too fragmentary to permit any dress reconstructions, some information about the costume of the ancient inhabitants of Ukraine can be gleaned from iconographic sources. The earliest representations of people date to Scythian times.

Greek vase painting (Vos 1963; Raeck 1981) and Scythian stone sculpture, toreutic arts and clothing appliques provide important information about male and female clothing of the Scythians (Artamonov 1969; Rolle 1989; Rolle *et al.* 1991; Reeder 1999; Aruz *et al.* 2000), although the images of men are much more abundant than those of women.

Greek vase-painting constitutes one of the most frequently used sources for the study of Scythian clothing (Vos 1963; Raeck 1981; Yatsenko 2006, 55–63; but see Gleba 2008). Their typical attire includes the tall, pointed hat with flaps on the sides and back, and the dress consisting of a long-sleeved jacket and tight-fitting trousers, all made of patterned material and trimmed with decorated strips along the seams. It has been suggested that colourful tight-fitting garments, also known from depictions of Scythian archers in painted Greek sculpture, were made using the sprang technique (Drinkler 2009).

Gold and silver objects from the kurgans of Kul'-Oba, Chortomlyk, Haimanova Mohyla and Solokha bear representations of Scythian men with astonishing details of their appearance, including their hair, clothing, shoes and weapons (Rolle *et al.* 1991; Reeder 1999; Aruz *et al.* 2000). Scythian jackets are clearly tailored, and fur-trimmed along the edges. According to Barber (1994, 133), ancient tunics developed in two major ways. The simpler variety consisted merely of a big rectangular cloth draped over the body and pinned, tied or belted in place. Such garments were typical for Greece. The more complicated type of tunic consisted of several pieces of cloth sewn together to create a sleeved garment. This was the type used by the Scythians. With such garments there was no need for pins or fibulae and, in fact, very few fibulae have been found in Scythian burials.

The tailoring is frequently emphasised in representations. This purposeful decoration also permits us to reconstruct the way Scythian

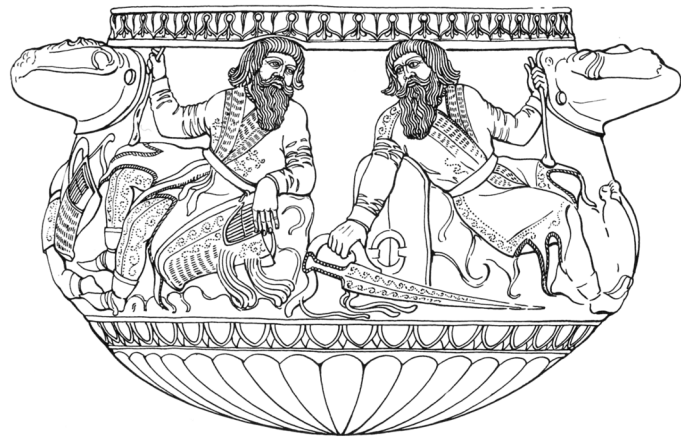


garments were tailored with some certainty. A gold-plated silver bowl from Haymanova Mohyla (Fig. 20.18), dated to the 4th century BC, depicts Scythians in such splendidly fashioned dress. The long jackets or kaftans are most likely of embroidered, fur-trimmed leather (Klochko 1991). An element particular to the Black Sea representations of Scythian clothing is the addition at the bottom of such jackets of long pointed flaps all around, which must have waved up and down very effectively during horse-riding (Rolle 1989, 58; Klochko 1991, 105; Gleba 2008).

Trousers in depictions are of both narrow and wide type. They are always elaborately decorated. Besides the tell-tale Scythian appliqués, patterned textiles were most likely used for this purpose. As mentioned before, the decorative elements on garments are placed in such a manner as to highlight the edges and the seams. Seams especially were emphasised with embroidery. In Slavic folk costumes even today, red embroidery is generally located at the seams and the openings of the clothing, such as neck-hole, wrists, and shirttail. This decoration supposedly was meant to discourage demons from crawling in at the openings (Barber 1994, 163).

The pointed hat, the main iconographic indicator of Scythians in Greek vase-painting, is not a frequent attribute on metal ware from Scythian burials. Only vases from Kul'-Oba and Voronezh bear depictions of Scythians wearing such headgear (Aruz *et al.* 2000, 207).

Considerably less is known about the dress of Scythian women. The female stone statue from Pregradnaya in Russia has a long, heavily



pleated dress tied with a belt around the waistline (Olchovsky and Evdokimov 1994, Fig. 74). A heavy cloak hangs from her shoulders and her head is covered with a veil hanging down to her shoulders. The gold plaques depicting a seated woman wearing a long dress, a headdress and a cloak covering the headdress and falling down behind her shoulders with a man standing in front of her, have been found in several burial mounds (Reeder 1999, 148). Another example is a 4th-century BC gold, cone-shaped plaque from a headdress found in Karagodeuashkh, southern Russia. Here, the scene is divided into three registers, the lowest of which depicts a frontally seated woman flanked by two female and two male attendants. The seated female figure is wearing a long, pleated dress and a tall headdress with a veil or cloak with decorated edges hanging down from it behind her back. Behind the seated woman stand two other women, wearing hood-like head covers.

The Greek historian Herodotos informs

Fig. 20.17. Spools from Motronyns'ke Horodyshe, Scythian (After Bessonova and Skoryi 2001, Fig. 57).

Fig. 20.18. Drawing of the gold-plated silver bowl from Haymanova Mohyla showing two Scythians clad in kaftans and trousers (Courtesy of Sergei Polin).

us that a characteristic element of Scythian clothing was the application of golden plaques on the clothing. In fact, such plaques constitute the majority of archaeological finds in wealthy burials of the Scythian and Sarmatian aristocracy (Jacobson 1995; Yatsenko 2006, *passim*). The ornamentation of clothing with such plaques is also attested by representations on Scythian objects and even in Attic vase-painting. When found *in situ* they are extremely useful for the partial reconstruction of the original dress. The contours of the garments and location of ornaments can frequently be traced. Recording the exact position of plaques *in situ* in this case is crucial for the understanding of a garment's appearance. Thus, the costumes of the men and women buried in Pisky, Kazenna Mohyla, Tovsta Mohyla, Zolota Mohyla and Sokolova Mohyla have been reconstructed this way (Klochko 1979; 199; Kovpanenko 1986). Women's shoes and headdresses are primarily reconstructed from the position of the golden ornaments in burials, as for example in Tovsta Mohyla and Melitopol's'kyi Kurhan. The majority of the gold ornaments found in female burials are, in fact, parts of elaborate hats of various shapes. They range from simple diadems to close-fitting caps, to magnificent affairs over 30 cm high, sometimes called *kalatthoi*. Various head decorations have been reconstructed from the material found in Chortomlyk, Kam'yana Mohyla, Berdianskiyi Kurhan, Tovsta Mohyla and others (Klochko 1979; 1991, 107–109; Rolle 1989, 60; Rolle *et al.* 1998, 144–145, Pl. 24).

Conclusions

This first overview of textiles and textile production in prehistoric Ukraine has hopefully demonstrated the richness and variety of the surviving finds and the necessity to consider them in a more systematic and synthetic manner. The nomadic lifestyle of the many cultures which inhabited the region during the long period under consideration inevitably led to the use of locally available materials such as grasses, and portable looms and techniques. In addition, more complex and luxurious textiles were obtained through exchange over vast distances. This resulted in the appearance on Ukrainian territory of exotic materials (silk, cotton, fine wool), dyes (true purple,

kermes, safflower) and techniques (gold thread, embroidery, tapestry, resist-dyeing) during the Iron Age. Both resist-dyeing and embroidering of textiles are techniques considered to have originated in the east. Scythia may have been one of the sources of these techniques for the Greeks (*cf.* Spantidaki and Moulherat in this volume). The expansion of Scythian and Sarmatian cultures stretching from the Hungarian plain and the Carpathian Mountains to the Chinese Kansu Corridor and linking Iran, and the Middle East with northern India and the Punjab, undoubtedly played an important role in the development of the Silk Road (Wieczorek and Lind 2007).

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Note

- 1 Except in the case of commonly used English equivalents (*e.g.* Kiev and Crimea) or sites on the Crimean Peninsula which are of Tatar or Russian origin, Ukrainian names are used for cultures, localities and natural features throughout this chapter.

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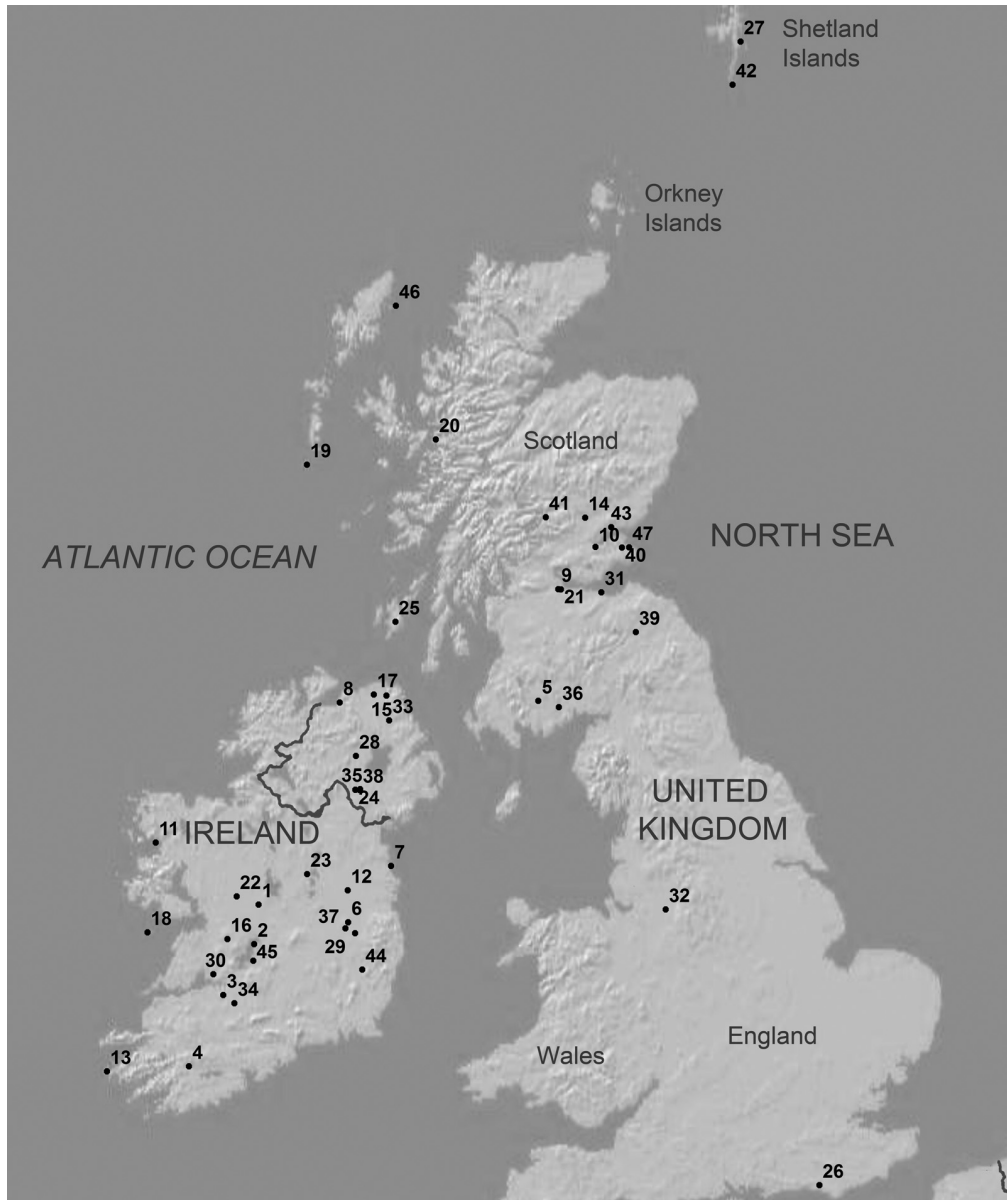
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UNITED KINGDOM AND IRELAND

Early Bronze Age	2700–1500 BC
Middle Bronze Age	1500–1000 BC
Late Bronze Age	1000–800 BC
Earliest Iron Age	800–600 BC
Early Iron Age	600–400 BC
Middle Iron Age	400–100 BC
Late Iron Age	100BC–AD 500
(England–Roman period	AD 43–410)

SCOTLAND AND IRELAND



Map. 21.1. Scotland and Ireland. Sites mentioned in Chapter 21:

1 Ardnaglug	11 Carrowbeg North	21 Falkirk	31 Leith Hill	41 Oakbank crannog
2 Ballinderry	12 Cloncowan	22 Gallagh	32 Lindow Moss	42 Old Scatness
3 Ballyveelish	13 Coarhamore	23 Grange Rath	33 Lisnacrogher	43 Pyotdykes
4 Ballyvourney	14 Craigie	24 Haughey's Fort	34 Lough Gur	44 Rathgall
5 Balmacelllan	15 Cromaghs	25 Islay island	35 Loughnashade	45 Richmond
6 Baronstown West	16 Derrybrien	26 Itford Hill	36 Milton Lock	46 Sheshader
7 Betaghstown	17 Derrykeighan	27 Kebister	37 Moynagh Lough	47 St. Andrews
8 Broighter	18 Dún Aonghasa	28 Killymoon	38 Navan Fort	
9 Camelon	19 Dun Cuir	29 Knockaulin	39 Newstead	
10 Carpow	20 Dun Telve	30 Knocknalappa	40 Nydie Mains	

Scotland and Ireland

Elizabeth Wincott Heckett

Introduction

The textile finds from Scotland and Ireland are few, but even so have interesting information to share on the way people dressed in prehistoric times. They can tell us something of the types of cloth and skins that were in use, and the styles and practicalities of the clothes that were worn. The earliest finds are from the Bronze Age and are made from horsehair, wool and probably flax. Various types of cloth have been preserved on metal objects like brooches, weapons and tools. Skin capes and a skin cloak have survived in the bogs as did a finely woven and decorated wool hooded cape. Indeed the majority of finds have come from bogs with a smaller representation of remains preserved by metal objects in graves.

Chronological and Cultural Background

In the 2nd millennium BC Scotland, circular timber houses and field systems were in use on the southern mainland, while in the wind-swept north, and on the islands stone houses were built. Extensive middens on the island of Islay contained decorated pottery

and animal bones (Ritchie and Ritchie 1981, 83–88). In the Later Bronze Age, from 900 to 500 BC, Scottish settlements were growing larger; the social structure reflected the rising importance of the individual, and of a new, secular aristocracy. The Iron Age, from 500 BC stretching perhaps to 500 AD, sees the emergence of different types of strongly enclosed and defended sites suggesting a society centred on localities and domestic activities (Armit 1998, 14). In Ireland as in Scotland, there was the development of an elite class of warriors and their families, deeply involved in status and personal display (Waddell 2006, 259). The introduction of iron working, for which the ore was locally available to many people in both Scotland and Ireland, gave the general population cheap access to more efficient tools and so to more involvement in the economy (Armit 1998, 17–18). People appear to have benefited widely from the accessibility of iron.

In Ireland, it seems there was a hierarchical social structure of tribal kingdoms with clear territorial boundaries, many of which have continued in local parishes and baronies until the present day (Waddell 2006, 275; Kelly 2006, 26–27). In the Late Iron Age in

Scotland larger tribal groups built up, with increased farming and woodland clearance (Armit 1998, 19). In both Scotland and Ireland in this era, people were living in hill forts, walled circular homesteads (dúns, stone forts and ring-forts) and island dwellings with hidden causeways set in lakes, known as crannogs. The Irish hill fort at Rathgall, Co. Wicklow is a good example of a Late Bronze Age settlement. Here, a site of considerable status was excavated containing the remains of weapon manufacturing, metallurgy, gold, amber fragments, glass beads and a hoard of bronzes. There were also cremated burials with their associated rituals. The residents of the hill forts probably included aristocratic warriors interested in ostentatious display of items of fine workmanship, and perhaps also a group of more professional fighters, and skilled craftsmen (Waddell 2006, 270–275).

The crops that were grown included oats, barley, rye, wheat (emmer and spelt) and flax. In Fife (Scotland), flax dating from the Bronze Age has been found. In the Late Iron Age, remains of flax appear in Northern Isles sites on mainland Orkney and on Shetland (Bond and Hunter 1987, 175; Bond 2002, 181). Small pieces of what appears to be linen cloth dating from the beginning of the 1st millennium BC were found at Killymoon, Co. Tyrone, Ireland (Wincott Heckett 2007, 28–34). Pollen samples from a contemporary lake site at Loughnashade, Co. Armagh, very close to the Irish Late Bronze Age royal site at Haughey's Fort, Co. Armagh demonstrate the presence of flax (Mallory 1995, 78–79). It seems that nettle was also gathered so that the fibres could be woven into cloth (Hedges 1974, 186–198).

The domesticated animals kept were cattle, pigs, sheep, goats and horses. In most cases, cattle seem to have been kept in larger numbers than other animals. However, an important development in the Irish Later Bronze Age was the increasing availability of domesticated horses which brought about major changes in society.¹ The imposing Haughey's Fort, near Navan Fort, Co. Armagh contained small traces of horse and dog, a few sheep or goat (3.1%), some pig (33.8%) and a preponderance of cattle (54.33%; McCormick 1994; Murphy and McCormick 1996).

The analyses of animal remains on habitation sites like Haughey's Fort show that initially only about 5% of the bones were from horses (van

Wijngaarden-Bakker 1974, 330). It seems likely, therefore, that the ownership of horses was a prerogative of a few people, presumably the powerful elite described above. This percentage is in keeping with Central European evidence since there also horse bones represented about 5% of the animal assemblages (Muller 1994, 143–145). Almost all the remains examined had been ritually buried in various ways, emphasising the importance of the horse in society, particularly for the elite few whose mobility increased enormously due to horse riding. Over time, warfare and travel changed significantly with this faster movement of people, and also trade and exchange increased since larger loads became possible.

It can be seen that, in the Iron Age in Ireland, horses were as highly valued as they were in Central Europe in the Bronze Age. At Navan Fort, Co. Armagh a small number of their bones, dating to the 4th and 3rd centuries BC, were retrieved from a ritual pond close to the main enclosure (McCormick 1994, 182). It is suggested that there was some sort of a ceremonial connection between their deposition and this important site. The occurrence of woven and plaited horsehair pieces in the Middle and Later Bronze Age in Ireland and Scotland, as well as in Denmark, reflects the growing significance of the prestige and utility of horses in society (Broholm and Hald 1940, 20; Glob 1974, 58; Sheridan 1997).

In the Irish Late Bronze Age and into the Iron Age, outstanding gold ornaments were made, and gold and bronze ingots were sent out of the country for trade or exchange. This wealthy society had wide-ranging connections with northern and central Europe, and with Iberia. There were close connections with Scotland whose inhabitants were also trading with North Germany and Scandinavia (Ritchie and Ritchie 1981, 80–83; Eogan 1990, 162–163). An unusual find from the Irish royal site at Navan Fort, Co. Armagh was the skull and jaw of a Barbary ape (*Macaca sylvanus*), dated to 390–320 BC (McCormick 1994, 183). Whether the animal reached Ireland alive, as a gift, or only the skull and jaw were brought in, it is a convincing example of the extended trading taking place.

An important feature of sophisticated display in dress in the Irish Late Bronze Age was the large amber necklaces, the beads of

which came from the Baltic, probably from Scandinavian sources. The necklaces ranged from ones with 10 or 11 beads to those with 400 and 500. This last set of beads, with some doubly-perforated spacer beads, was found scattered in a bog at Derrybrien, Gort, Co. Galway; originally, they would have been made into an imposing, many-stranded upper body decoration. It is likely that the amber found in Ireland is of Baltic origin, perhaps from Denmark and the north German plain (Waddell 2006, 258–259). Locally found lignite or jet was crafted into bracelets that seem to have been popular adornments (Hencken 1942; Collins and Seaby 1960, 25–33; Raftery 1974, 28–29; Williams 1978; Hurl 1995).

The Irish and Scottish Iron Age is understood to begin no earlier than *c.* 800 BC. The Late Iron Age continues into the 6th century AD; the Roman presence in Scotland reached only to the Antonine Wall, which was first built in the 2nd century AD. The earlier Roman fortifications are dated to the 1st century AD (*cf.* Wild in this volume). Ireland, of course, was never occupied by the Roman imperial armies. It may be said that the Iron Age is something of an enigma to Irish archaeologists, as it shows some Hallstatt influence, while strong late La Tène tendencies too are present in the decorative arts. These can be seen in the gold collar from Ardnaglug, Co. Roscommon (3rd century BC), the gold collar in the Broighter Hoard (1st century AD), and the trumpet from Loughnashade, Co. Antrim (1st century BC) (Kelly 2002, 135 [pl. 4:3, 147], 138 [pl.4:10,153] 139 [pl. 4:15, 157]). Graves and settlements are sparse, and it has been noted that there are more finds relating to the Roman Empire (whose army and authority never entered Ireland) than there are of indigenous origin. However, recent Iron Age excavations ahead of major road construction projects and the more frequent application of scientific dating methods have altered the record. Whereas 12 royal and settlement sites were identified before 1994, by 2008 more than 200 sites and site complexes were recorded (Becker 2009, 253–361).

In the Later Iron Age from about 300 BC, the style of flowing curvilinear ornament, Early Celtic Art, developed in both iron and bronze artefacts. In Ireland, a series of bronze scabbards from Lisnacrogher, Co. Antrim is a fine example of this style. Horse-gear

trappings from both Ireland and Scotland emphasize the still-growing influence of the horse in society, and armour and weapons underline the importance of the warrior class. Personal ornaments include fibulae and, in Ireland, impressive decorated bronze discs and horns that were perhaps parts of ceremonial headdresses (Waddell 2006, 288–316). A Scottish hoard of gold torcs made in south-west France (300–100 BC) was found recently in Stirling; two of the torcs are exactly the same design as torc fragments held in the National Museum of Ireland (Cahill 2010, 6–7).

Many of the personal possessions are clearly indicators of power and position demonstrating the importance of ostentatious display for some elite members of society, and of presenting an imposing ‘face’ in the community. Although comparatively few remains of dress have survived, we can presume that garments of cloth or skin would also have been part of that *persona*, and would have carried messages about status clearly understood by contemporary society.

Tools

In Ireland, there is very little evidence for the types of looms used and there are almost no finds of loom weights. There is, for example, a single mudstone disc described as a possible loom weight or line sinker found at the settlement at Grange Rath, Colp West, Co. Meath. By comparison, at the Later Bronze Age site of Itford Hill, Sussex (1000 ± 35 BC) a weaving hut was found, with a one metre square setting for a simple upright loom. Several fired clay loom weights had been trodden into the floor (Megaw and Simpson 1979, 265). In the circumstances, it seems possible that the upright loom was used in Ireland throughout the Later Bronze Age and into the Iron Age.

There are single finds of spindle whorls from several sites, and one important collection from the Late Bronze Age where twelve whorls were found, together with cloth fragments on a work-place at Killymoon, Co. Tyrone. This may suggest some type of group activity with spinning being carried out. Neolithic polished stone axes were also excavated here. Although these may have still been in use as tools, it is interesting to note that, by the 7th century AD, these axes seem to have been used for smoothing linen (Wincott Heckett 2007).

Small finds of spindle whorls of both bone and stone have been found in the following Late Bronze Age settlement sites: Lough Gur, Co. Limerick (Cleary 2003, 130–131, fig. 17), Ballyveelish, Co. Tipperary (Doody 1987, fig. 2:4), Ballinderry, Co. Offaly (Hencken 1942) and Knocknalappa, Co. Clare (Raftery 1942). Two whorls were found at the fort at Dún Aonghasa, Aran Islands, Co. Galway and at a crannog site at Moynagh Lough, Co. Meath. Other single items came from Ballyvourney I, Co. Cork and Cloncowan, Co. Meath. Two other whorls were found in outdoor cooking places known as *fulachta fiadh*, at Site L/M, Richmond, Co. Tipperary and Coarhamore, Co. Kerry (Wincott Heckett 2007, 32). No spindle whorls have been found in any Late Bronze Age Irish hoards (Eogan 1983, 13–21). The bias here is towards weapons, tools and ornaments. Textile equipment presumably was not seen to have any connection with such depositions.

The Iron Age monument at Knockaulin, Co. Kildare has been identified as *Dún Ailinne*, seat of the Kings of Leinster. Finds here included several iron needles together with fragments of bronze fibulae and glass beads (Waddell 2006, 325, 347). The needles show that the new, cheaper iron technology had been adopted by garment makers as well as by smiths.

In Scotland some stone spindle whorls were found in the broch (dry-stone tower) at Dun Telve, Glenelg, Inverness-shire dated to the 4th century BC–1st century AD (Curle 1916, 241–254). From Later Bronze and Iron Age excavations at Kebister on the island of Shetland, stone spindle whorls were recovered. The materials used for these tools in both periods were quartz and sandstone. Stone implements were common on most northern Scottish sites and were probably manufactured locally. There is no evidence for imported stone implements on the island in Kebister's prehistoric period (Owen and Lowe 1999, 282). Iron Age whorls made from potsherds were also found on Shetland at Old Scatness (Dockrill *et al* 1996, sf 2197).

Spindle whorls have also been found in crannogs. One stone piece, together with an enamelled bronze fastener, was recovered from a crannog on Milton Lock, Kirkcudbrightshire dated to the 2nd century AD (Piggott 1952–1953, 134–152).

Raw Materials

Raw materials available for clothing included oxhides, sheep, goat and deer skins, wool, nettle and flax fibres. Evidence for their availability can be gathered from the data on the faunal and botanical remains found in excavations. At Lough Gur, Co. Limerick 33 % of sheep/goat were allowed to reach maturity, and were slaughtered at 3 to 3.5 years, and so would have yielded more wool and larger skins than younger animals. About 27 % of cattle were also killed at maturity (Cleary 1995; Waddell 2006, 210). These would provide even larger skins for capes, bedding and perhaps shrouds. A reference to the burial shroud of an Irish prince in the 7th century AD *Annals of Ulster* suggests the use of skins for shrouds. The early Irish word used for a shroud in the *Annals* is *geimen*, which is related to *gemen*/hide (Leigh Fry 1999, 124). The hides of cattle were laid beneath bodies in Danish Bronze Age burials, and so may well have been used for bedding in life as well as death (Broholm and Hald 1940, 15–20).

The Late Bronze Age fort known as Haughey's Fort, Co. Armagh (close to Navan Fort) has interesting finds of large pottery vessels with traces of plant remains that may have been used for tanning hides (Waddell 2006, 217). Until the late 1980s in Argyll, Scotland, sheepskins complete with their wool were tanned by the bark-tanning procedure that may have been used in antiquity (Carter and Rae 1988, 13–14). In the 1980s, a skilled professional, Mrs. Molly Arthur of Grogport Rugs, Argyll, Scotland, used the traditional bark-tanning method to tan sheep, deer, leopard, pine marten and fox skins. In this process the wool or fur is retained. When working with sheepskins, she scraped off the excess fat, washed the skins and wool six times, and immersed them for one to two weeks in the tannin solution. The total time taken for these procedures was four weeks. Stretching the skins on frames was followed by hand softening, rubbing with a stone, trimming and brushing. Mrs. Arthur commented that "not only does the skin remain soft and supple, it can even be washed without losing its original characteristics" (Carter and Rae 1988, 13–14). It may well be that this was the type of process employed in the Bronze and Iron Ages in Ireland and Scotland.

Amongst the faunal remains from Haughey's Fort, there were the remains of a single red deer, a fox, a wild pig and some horse bones (Waddell 2006, 217). These animals could also provide the raw materials for clothing or body ornaments. For example, the Iron Age male bog burial found in Lindow Moss, Cheshire, England was seemingly without clothing, but the man wore a single armband of fox fur (Turner 1995, 208).² New research into animal remains found at settlements in the Orkneys in Scotland shows that foxes were deliberately reintroduced into the islands in the Iron Age, probably from the last few centuries BC to the mid to late 1st millennium AD. Examination of the bones shows that the animals had been skinned whole but not butchered, so the pelts would have been suitable for clothing and 'trophies'. Perhaps, the skins were worn as head-coverings or slung around the shoulders. Badger bones were also present in the Orkneys in the Late Iron Age, as they were in the Outer Hebrides at that time. They may represent imported skins and could also have been used for clothing (Barrett and Fairnell 2007). This interesting research focuses our attention on the role that skins may well have played at that time, for clothing, furnishings, ceremonial purposes (*cf.* Mannering *et al.* in this volume).

Although many of the garments in the Later Bronze and Iron Ages were made from the skins of cattle and sheep, it seems that an interesting minority of unusual animals were used as well. Perhaps there were particular social and community reasons why people chose or were chosen to wear different animal skins.

Bronze Age

Scotland

There is one find from the Middle to Late Bronze Age and three from the Late Bronze Age. This first find from Sheshader, Lewis in the Outer Hebrides (*c.* 1300–840 BC) is an unusual artefact, consisting of two associated hanks of cattle hair with finely plaited horsehair bands attached to each side, and a separate wool cord (Sheridan 1997, 189–190). One hank of the cattle hair is 40 cm long and 60 mm at the greatest thickness. It looks like the forelock of an ox and is quite similar to those of the indigenous Highland cattle. Of the two horsehair plaits one is *c.* 30 cm long,

the other may have been even longer originally. This suggests that the artefact could have been worn tied to the face, leg or the body of a small person (Wincott Heckett 2007, 31). Perhaps it was used as a mask at communal dances and other festive or ceremonial occasions.

Should the earlier range of the dating, at *c.* 1300 BC be correct, the Sheshader plaited horsehair bands would be almost contemporary with the horsehair plaited bands attached to the horsehair net worn by the woman buried at Skrydstrup (Broholm and Hald 1940, 20; Mannering *et al.* in this volume) and with the horsehair framework of a wool mesh hairnet found beside the Egtved girl (Glob 1974, 58). The Danish Bronze Age mound burials date to the second half of the 2nd millennium BC (Broholm and Hald 1940, 42–44, 56–60, 73–74; Jensen 1998, 65, 115). Wool cloth and animal hides that still have their hair are commonly used in Danish burials. The Skrydstrup woman is a good example in that she was wearing wool clothes, had wool cords round her head and also a horsehair hairnet. She was placed on and covered with a cow-skin (Broholm and Hald 1940, 15–20).

The Late Bronze Age Scottish site of St. Andrews, Fife, yielded an important find of textile, hair and plant fibres closely associated with metal rings, all part of a major hoard. Three textiles were recorded: a well-balanced tabby in wool was made from z-twisted single yarn with a thread count of about 6–8 threads/cm. A bast fibre tabby weave, perhaps in hemp, was made from S2z-ply yarn with an average thread count of 6/16 threads/cm. The largest bast fibre textile (7 × 4 cm) was also a tabby weave, with a count of 14/12 threads/cm (Gabra Sanders 1994, 34–41).

The functional uses of textiles and early recycling practices are demonstrated by the finds from Nydie Mains, Fife and Pyotdykes, Angus (Henshall 1964, 197–198; Hedges 1974, 293–295). In these burial sites were the remains of a bronze knife and spearhead respectively. Serving as plugging material inside their sockets were pieces of bast fibre tabby weaves. The Pyotdykes cloth was first identified as linen by Michael L. Ryder (Henshall 1964, 198), but later Hedges suggested the fibres were from nettle (1974, 293–295). Thread counts are about 10–11/8–9 threads/cm using S2z-ply yarn (Pyotdykes, in both systems, Nydie Mains in one system but with a slight z-twisted single

yarn in the other). Both pieces have survived because of the preservative qualities of the metal artefacts.

Ireland

Textiles, twined objects, spindle whorls, human and animal hair were found in excavations carried out in 1995 and 1996 on a site at Killymoon, Co. Tyrone, dated *c.* 1000 BC (Hurl 1999). Archaeologists were already aware of the importance of Killymoon since in about 1816 a fine gold ornament of the Bronze Age described as a 'dress fastener' was found in a hollowed-out wood box, perhaps in a local bog or maybe near the later excavations (Cahill 2002, 87, 89, 96, 105 pl. 3:8). Mounds and dumps of ash and burnt clay and sizeable deposits of charred barley were excavated here. A socketed bronze axe, stone spindle whorls, polished stone axes, saddle querns, rubbing stones, hammer stones and a large amount of coarse pottery were also found. As noted earlier, parts of two clay moulds, one for a stick-pin and the other perhaps a spearhead, two fragments of lignite bracelets and a few small pieces of rock crystal were recorded. Under a spoil heap west of the central mound were two important gold objects, another 'dress-fastener' and a 'sleeve fastener'. The larger item may have served to close a cloak or as a bracelet, the smaller type has recently been identified as an ear ornament (Cahill 2002, 89, 97, 108, pl. 3:11). It has been argued that these objects were specifically deposited for secular or ritualistic purposes, since the gold ornaments appear to have been deliberately hidden under the spoil heap (Hurl 1995). Mostly found in hoards, or as single items, they are seldom associated with settlement sites.

Analysis of the textiles, hair and fibre remains demonstrated that there are seven different pieces of cloth from six different find spots. Two of them are made of wool, one with a pile weave. The other five textiles are woven in plant fibre, very likely flax, and are of the same fine quality tabby weave but with varying thread counts (10/12 to 20/20, S2ply in both systems). These small pieces have survived only because they were partially carbonised by fire. The sizes of the original loom pieces and their function can only be guessed. Of particular interest among these remnants were eight to ten folded-over layers of cloth. This meticulous folding and storage

suggests that linen was seen as a valuable resource. Originally, perhaps the cloth may have been stored in a wooden container since that would have provided some protection against the fire. It also seems unlikely that such fine cloth, carefully folded, would be left lying about, in an open-air work area. However, if it were part of an offering, intended for deliberate burning it would have been reasonable for the cloth to be laid out on the ground (Wincott Hekett 2007).

Such textiles may have been imports since there were trading routes from Ireland to Britain, south Scandinavia, and to the Iberian Peninsula where similar contemporary linen textiles have been recorded (Alfaro Giner 1990 and in this volume; Eogan 1995; Almagro-Gorbea 1995). However, there is a strong argument for indigenous production. Mary Cahill, in her studies of Irish Bronze Age gold work, argues that the production of pieces such as the Killymoon ear ornaments and bracelet must have involved the managed use of human resources by a society that was complex, hierarchical in structure and able to support highly skilled craftspeople (Cahill 1998, 37–38). Since it is clearly established that the high quality gold items were made in Ireland, it follows that similar skills of textile workers could also have produced the fine, folded cloth in Co. Tyrone. Perhaps it is pertinent that Killymoon townland is in the neighbouring county to the high status site of Haughey's Fort, Navan, Co. Armagh (discussed above), so that the inhabitants of the Fort would have influenced craftspeople in the area.

The wool cloth and the horsehair woven ornament from Cromaghs, Armoy, Co. Antrim were found in 1904. They are presently dated to 900–500 BC, weighing towards 800 BC (Eogan 1983, 7, 12). The wool cloth consists of two sizeable pieces of the same weave, with some borders and selvages, sewn together to make up a rectangle of about 105 × 75 cm. Some parts may have been lost when it was retrieved from the bog. The cloth was wrapped around a small hoard, placed in the bog, with the horsehair ornament laid on top. The hoard included a socketed bronze axe, a knife or razor in a hide case with the hair left on, and turned to the inside, and a very large sunflower pin that seems to have been pinned into the wrapping cloth, perhaps holding it together. The peat digger who found the hoard reported that

Fig. 21.1. Detail of sewing on deerskin tunic, Gallagher, Co. Galway, Ireland (After Wilde 1861).

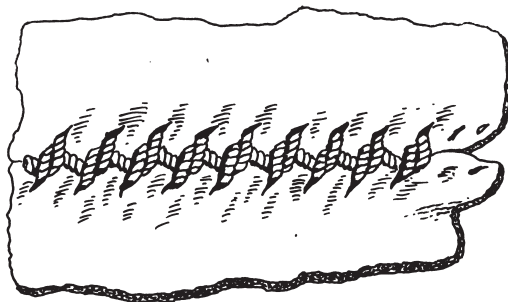


Fig. 21.2. Gundestrup cauldron male figure wearing sleeved tunic (© The National Museum of Denmark).

there were also “remains of leather straps, some about 3 cm in width, some narrower”, and there were some items like beads or buttons, perhaps also of leather but “these all crumbled away at once” (Coffey 1906, 119–120). If the leather straps were associated with the woven cloth, it is a possible interpretation that, together, they were originally used as a garment. The wool cloth weave is tabby; the direction of the twist in both systems is z, and the density is 6/7 threads/cm. The borders, but not the main part of the weave, are woven with one system predominating, giving a ribbed or rep effect (Coffey 1906, 119–125).

The exquisitely worked horsehair band with tassels at each end is in herringbone 2/2 twill weave and displays an extremely high standard of skill. The end of each small tassel is decorated with a tiny finely worked bobble. The band is woven with a thread density (44/12 threads/cm) that places it among the finer pieces of the time. The use of horsehair to make the tasselled band emphasises its importance. In the Late Bronze Age, horses constituted only a small percentage of domesticated animals, and



Fig. 21.3. Otter-skin cape, Derrykeighan, Co. Antrim, Ireland (Photo: E. Wincott Heckett).

were high-status possessions (Wincott Heckett 1998a; 1998b).

It is interesting that, in several of the other Bronze Age finds, wool cloth or cords are closely associated with horse and/or cattle hair and range from the fine 2/2 twill of the Armoy ornamental horsehair band to the simple clumps of hair in the St. Andrews' collection. Perhaps there were working groups involved in the preparation and construction of cloth, clothing and cords from the hair, wool and skins of domesticated animals like sheep, goats

and horses, and from plant fibres such as flax, hemp and nettle. At this time, horsehair would be very likely to be much sought after due to novelty, scarcity and association with the elite warrior group.

The use of horsehair in the Bronze Age in northern Europe may well be linked with elite burials and activities. The expertise displayed by the makers of the intricate Cromaghs woven ornament reflects the high status both of its owner and of horses in society. The small amounts used in the nets, plaits and woven



Fig. 21.4. Skin (perhaps wolf) cape, Derrykeighan Co. Antrim, Ireland (Photo: E. Wincott Heckett).

ornaments seem to relate to the rarity of horses in northern European societies.

Early Iron Age

The number of textile artefacts from the Scottish and Irish Iron Ages is rather small in comparison to other parts of Europe. There are six textiles and four items of skin clothes from Ireland and 12 textiles from Scotland, including a complete hooded cape.

Ireland

In Ireland there are well-established royal inauguration sites and ancient land boundaries, and an unequalled literary tradition often seen to be related to the Celtic Iron Age, but there are comparatively few actual artefacts. Four of the Irish remains of textiles have survived because they were in close contact with metal objects. An oval bronze disc showing traces of fine network or gauze-like weave of fine hairs, that are completely mineralised, and an annular brooch with perhaps a fragment of 2/2 twill attached (NMI E188:109–110) dating to *c.* AD 200–500 were found in Betaghstown, Co. Meath (Bender Jørgensen 1992, 20, 215).

The burial of a woman at Carrowbeg North, Co. Galway retained traces of cloth (NMI1937:3106) on the back of a most unusual ‘locket-like’ pendant lying in the vicinity of her right shoulder. There were also 12 bone beads near one ankle, perhaps a decorative anklet. The cloth of tabby weave may have been linen, suggesting that the woman wore a dress or blouse fastened at the right shoulder (Wilmot 1939; Raftery 1981, 187, 190; Bender Jørgensen 1992, 215). From the high status site of Navan Fort, Co. Armagh, there is a textile impression of a good quality tabby weave (NMI 1906:129; Raftery 1983, Cat. No. 805, fig. 215; Bender Jørgensen 1992, 215). There were also large areas of bog land from which some bodies and artefacts have been recovered, among them pieces of clothing.

Gallagh, County Galway

In 1821 a male body wearing a deerskin garment was found at Gallagh, Co. Galway. The find is radiocarbon dated to 3840 ± 70 BP; 2320 ± 90 BP; 2220 ± 90 BP, *i.e.* 6th–2nd centuries BC. The garment worn by the Gallagh Man has in the 20th century been

described and illustrated as a cape, but in the original accounts of 1825 and 1828 it was said to be “a tight dress, covering also the limbs as far as the elbows and knees” and “formed in the shape of a tunic” (Petrie 1825, 433; O’Kelly 1829, vii). It was fastened together down the front with careful stitching, and the hairy side of the skin was turned to the inside (Fig. 21.1). The details of the deposition of the man, who had apparently been garrotted with withies (willow shoots) and had two poles placed at his feet, are consistent with Iron Age bog deposits in other parts of Europe. Indeed so are those of the Baronstown West male burial (see below), where the head was missing, although the scalp was present and stakes were laid across the body.

It is tempting to conjecture that the Irish Early Iron Age garment could have been shaped like those of many of the figures on the Gundestrup cauldron, particularly as shown on the kneeling figure on Plate C, or the cross-legged, seated and horned figure on Plate A (Fig. 21.2; Olmsted 1976, Figs. 6 and 7). It is possible that the interpretation that the Gallagh garment was a cape developed later in the 20th century (by which time only small pieces of the skin survived) without reference to the original literature, under the influence of other European finds of capes, such as the unique deer-skin garment of rectangular shape found in Søgaaards Mose II (Hald 1980, 34; Mannering and Gleba forthcoming; Mannering *et al.* in this volume).

Derrykeighan, County Antrim

There are two capes from Derrykeighan, Co. Antrim. In AD 1861, an almost complete skin cape was found in Derrykeighan bog, unrelated to a body. It is radiocarbon dated to 1959 ± 28 and 1974 ± 30 BP, *i.e.* 1st century AD. It was identified in the 19th century as being made from otter skins (Fig. 21.3; MacAdam 1861, 299). Recently another cape of similar size but using larger pattern pieces has seemingly been recognised as also coming from Derrykeighan (Fig. 21.4). The pattern and methods of stitching are definitely the same, with some differences perhaps arising from the fact that the skins are from two different kinds of animals. It is suggested that the skins of the second cape might be from wolves.

An analysis of the first cape recorded six to eight larger pieces of skins and a combination

of medium and small pieces sewn carefully and skilfully together with gut or sinew (and mended with larger stitching). A full count of the pieces could not be made because part of the cape is missing, but at least 65 pieces were used. At the back, at both the top and bottom of the cape, the skins have been carefully cut and trimmed to create the shaping of the cape, which fits snugly over the shoulders. The pattern of the Huldremose skin capes and others from Danish sites seems to be different from the Irish examples. The former were made from sheep, goat and calf or cattle skins (Hald 1980, 314–315, 320; Mannering *et al.* in this volume).³

Clongownagh Bog, Baronstown West, County Kildare

A semicircular oxhide cape and a wool rectangular mantle/tunic were found together with a male body in Baronstown West, Clongownagh, Co. Kildare (Wincott Heckett 2001). The find is radiocarbon dated to 1725±30 BP, *i.e.* 2nd–5th century AD. The wool garment was pinned together with little wooden pegs down the back of the man, and the skin cape was under him. The rectangular wool cloth seems to have been put onto the corpse as a mantle. It was folded in a cone shape with a triangular piece of the cloth (representing two adjacent edges) turned downwards at the shoulders, so that the two lower parts of these could be pulled together and pinned. In this case, after death it was pinned at the back of the man. In life it would have been pinned together at the front; the use of long thorns in Scotland to pin garments together was noted by Martin Martin in his book *A Description of the Western Isles of Scotland, 1703* (McClintock 1943, 130–131).⁴

The skin cape retains the remnants of hair. There is no record as to whether the haired side of the cloak was worn towards or away from the body. The cape has ties and corresponding eyelet holes on the haired side that enabled it to be closed in the front, creating a cone or bell shape that would have reached to the knees of the wearer (Fig. 21.5). The cape could have been worn over the shoulders, or lifted up so that the head was also covered. This type of garment is well-documented as having been widely worn in northern Europe and in the Roman Empire (Wild 1963, 193–202).

Scotland

In Balmaclellan, Kirkcudbright, several fragments of a 2/2 diamond twill cloth, made from wool of fine quality and a light brown colour were retrieved from a bog. They probably survived because they were wrapped around four small packages of ‘Celtic’ La Tène bronzes. They included an elaborately decorated bronze mirror, whose dating indicates that the parcel would be most likely from the 1st and 2nd centuries AD. In those troubled times when Roman forces were active in the south of the island there could be several reasons why it was put into a bog (Crowfoot 1947–48, 225–227, 230–231; Wild 1970, Tbl. A42; Bender Jørgensen 1992, 198).

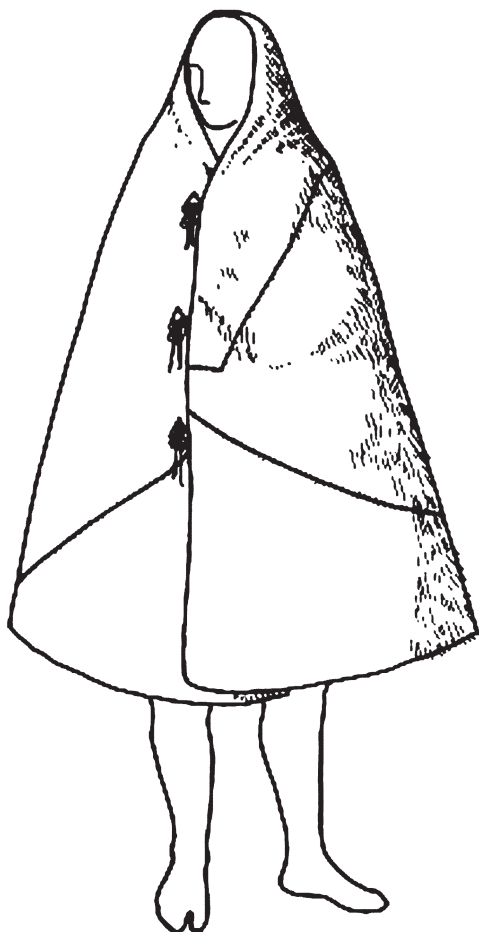
Further to the north, a small fragment of broken twill cloth, with checks in yellowish and brown, woven with very fine wool yarn, was found close to the Antonine Wall near Falkirk, Stirling. The cloth had been put into the mouth of a red earthenware jar that contained at least 1925 Roman coins dating between 83 BC and AD 230. As before, the cloth may have survived because it was wrapped around silver coins. This large hoard may well represent monies paid by the Roman authorities to a local chieftain for his support over a period of years. The hoard was probably buried in an emergency. The textile is now regarded as an early indigenous example of the cloth that much later became known as tartan (Crowfoot 1947–48, 227–231; Ritchie and Ritchie 1981, 119–120; Bender Jørgensen 1992, 198).

It is unusual for cloth to be recovered from an underwater site but this is how a fine wool 2/1 twill cloth was found in Oakbank crannog in Loch Tay. The site was excavated with underwater excavation techniques (Morrison 1985, 24–25, 81–98). The twill cloth with a relatively high thread count, 11–14 in warp and 9–11 in weft, has the early date of 595 ±55 BC. The thread counts are similar to those of the Balmaclellan 2/2 diamond twill and are 15 and 11 threads/cm in warp and weft respectively.

There are a few examples of fragile textile remains that have survived because they were in contact with iron objects. An Iron Age/Early Roman Period iron annular brooch with very indistinct textile remains, probably 2/2 twill, came from Craigie near Dundee, Angus, and an iron fragment with textile remains of a tabby weave from Dun Cuir, Isle of Barra, Inverness (Henshall 1955–56; Bender

Fig. 21.5. (left) Ox-bide cloak, Clongowmagh, Co. Kildare (Drawing: Rhoda Cronin).

Fig. 21.6. (right) The Orkeny Hood, Scotland (© The Trustees of the National Museums of Scotland).



Jørgensen 1992, 198). An iron brooch with faint textile remains, probably tabby weave, and an iron belt buckle with badly corroded textile remains, also probably tabby weave with a narrow tablet-woven border, came from two crouched bodies buried in a cist, at Leith Hill, Moredun, Gilmertin (Crowfoot 1947–48; Ritchie and Ritchie 1981, 98; Bender Jørgensen 1992, 198).

Roman Period

More closely associated with the Roman influence are some textiles found in or near Roman fortifications. The Roman fort built at Newstead, Melrose, Roxburghshire was built and rebuilt in the 1st and 2nd centuries AD. Excavations there uncovered exceptionally fine brass and bronze cavalry parade helmets and face masks, and much military equipment. Two types of woven cloth were found, one a half-basket weave, z/z twisted, the other a rep weave, z/unspun, of plant fibre with some

more associated decayed fibres. There were also some clumped together s-twisted threads (Curle 1911; Ritchie and Ritchie 1981, 119–120; Bender Jørgensen 1992, 199).

A late 1st-century AD cist burial near Camelon, Stirlingshire, contained the remains of two armed men, perhaps Roman auxiliaries, together with their weapons. On one of the swords there was a small piece of cloth, probably 2/2 twill, z/s-twisted, thread count 14/13 threads/cm (Ritchie and Ritchie 1981, 119–120; Bender Jørgensen 1992, 199). A further textile was found at the early 3rd-century AD Roman fort of Carpow on the river Tay, Perthshire (Ritchie and Ritchie 1981, 119–120; Bender Jørgensen 1992, 199).

Late Iron Age

A very impressive hooded wool cape with two attached tablet-woven borders, one fringed, woven in 2/2 broken chevron twill with paired wefts was found in St. Andrew's Parish, Orkney

(1595±80 BP OXA-3535 [AD 250–615]). The cape, known as the Orkney Hood had previously been attributed to the Viking Age but has now been reassessed to earlier date (Henshall 1950; Ryder 1968, 12, 139; Gabra Sanders 2001, 98–99; Findlay n.d., 95–102). It is an extraordinary garment that has been made and remade over time so that it is smaller now than when it was new. The cape has two fine tablet-woven bands sewn onto it, one with dramatically long fringes that fall below its lower edge. The hooded cape (Fig. 21.6) has remains of leather thongs inside it just below shoulder level, perhaps so that it could be secured against adverse weather, or for physical activities like horse riding.

The weft of the tablet-woven band has been substantially extended to create the striking fringe that hangs down around the lower edge of the cape. The technique of extending the weft system of a tablet-woven band was well known in the Iron Age in Europe and there are a few examples of fringed bands. It was an accepted practice to make the tablet-woven band the starting border of an intended piece of cloth, with an extended weft system being transformed into the new warp system for the weave. This was often used when making large rectangular mantles and blankets (Bender Jørgensen and Wild 1982)

Conclusions

Several questions are raised by the existence of the cloth and clothing described here. For example, ongoing research in the National Museum of Ireland into bog bodies and their social context has shed new light on the cultural context of Iron Age Ireland.

In June 2006 a new exhibition of Iron Age bog bodies and related artefacts opened at the National Museum in Dublin. Two bodies (Oldcroghan, Co. Offaly, 1984 and Clonycavan, Co. Meath 1996) were put on display; sadly there was no clothing associated with them other than a plaited leather armband with a metal closure. Clonycavan Man, probably an elite male, sported an elaborate hairstyle; it is clear that he used a hair 'gel' made from the imported resin of a pine species, *Pinus maritima*, particular to the southern part of Gaul and the Iberian peninsula, and animal fat.

However, an interesting hypothesis is explored by Eamonn P. Kelly relating to

the placement in specific locations of such bodies and other artefacts like swords, gold collars, bronze horns from a headdress, bridle bits, wooden block wheels and indeed, butter (Kelly 2006, 26–27). He has established that many such depositions lie on, or close to, present-day land boundaries (known as barony, townland and parish boundaries), which in fact, have existed there since the days of Irish kingdoms and, he believes, since at least the Iron Age. Kelly has considered known aspects of early Irish ceremonies associated with the consecration of kings that included specific rituals, and postulates that items that had been used as part of the 'coronation' rites were then deposited on these territorial boundaries to emphasize their important and, indeed, sacred nature. He also suggests that ritual killings associated with sacral kingship and fertility rites may have entailed burials in these same significant boundary areas. It is relevant to the discussion here in the context of Iron Age clothes that he sees such links for the Gallagher Man, dressed in his deerskin garment, the Baronstown Man with his wool mantle and oxbide cloak, and the Derrykeighan capes, since in each case they were placed on barony boundaries. The suggestion is made that these clothes may have had ceremonial connotations linked with the status of the corpses. This may explain why the Gallagher Man was strangled by the withies around his neck, and the head of the Baronstown Man is missing (although the scalp remains). The depositions underscore the importance of the boundaries of the particular kingdom, and so of the authority of the ruler.⁵

It is suggested that the Derrykeighan capes were royal regalia worn at an accession ceremony, and deposited on the boundary of the barony of Lower and Upper Dunluce as a statement of territorial authority, and as definition of the king's sovereignty. The find spot of Gallagher Man is closely connected with ancestral lands of the ancient and important O'Kelly family, former kings of Uí Maine.

Perhaps the Orkney Hood was deposited for similar reasons. If the garment was part of the regalia of the local elite, it would be understandable that the original hood could have been remade to be worn by a young aristocrat at his accession. Indeed he may have proved his rights by wearing his ancestral headdress/cape; we know this happened in

medieval European coronation ceremonies where the wearing of historic royal robes was an essential part of the conferring of sacral power and authority. Even later, in the 16th century in Ireland, the gifting from noble fathers to sons of specific armour, jewellery, horses and cloaks established and underlined the continuity of familial power and authority. This is illustrated in the bequests by Piers Butler, eighth Earl of Ormond to his two sons (Wincott Heckett 2004, 63–75).

Punishment or elimination of members of the elite by other more powerful persons may have been a successful strategy for the latter to maintain their position. The placing of bodies and their clothing into bogs and other burial grounds most likely had specific important meanings for the Bronze and Iron Age communities in Ireland and Scotland who carried out and witnessed these rites. The archaeology of dress plays as significant a role in decoding the past as do other studies of material culture.

The expanding research into the varied pieces of clothing and other textile remains from Europe can provide valuable insights into the level of skills and technologies prevalent at the time. The structure of communities and society can be usefully studied in this context.

Notes

- 1 Domesticated horses were known in Ireland in the earlier Bronze Age about three and a half thousand years ago (van Wijngaarden-Bakker 1974, 347).
- 2 It may be that Lindow Man was wearing linen clothing but this would not have survived in the bog (*cf.* Mannering *et al.* in this volume; Mannering and Gleba forthcoming).
- 3 The occurrence of two skin capes together is, of course, also known from Denmark. Again the cape finds from Borremose are an interesting parallel since it seems they may have been worn as a pair, perhaps with the 'woolly' (lamb or sheepskin) cape worn with the wool innermost and the smoother, short hairy skin of the other cape facing outwards (Hald 1980, 316–317; Mannering and Gleba forthcoming; Mannering *et al.* this volume).
- 4 Martin Martin describes the costume of the Highland men (McClintock 1943, 130–131): "When they Travel on Foot, the *Plaid* is tied on the breast with a Bodkin of Bone or Wood (just as the spina worn by the *Germans* according to the description of Tacitus)".

- 5 The author understands from Eamonn P. Kelly, Keeper of Antiquities at the National Museum of Ireland, that in the Museum there are at least six old finds of cloth or clothing associated with burials that have not been dated, but may be from the Iron Age. It is hoped that a programme for their dating and analysis can be initiated in the near future.

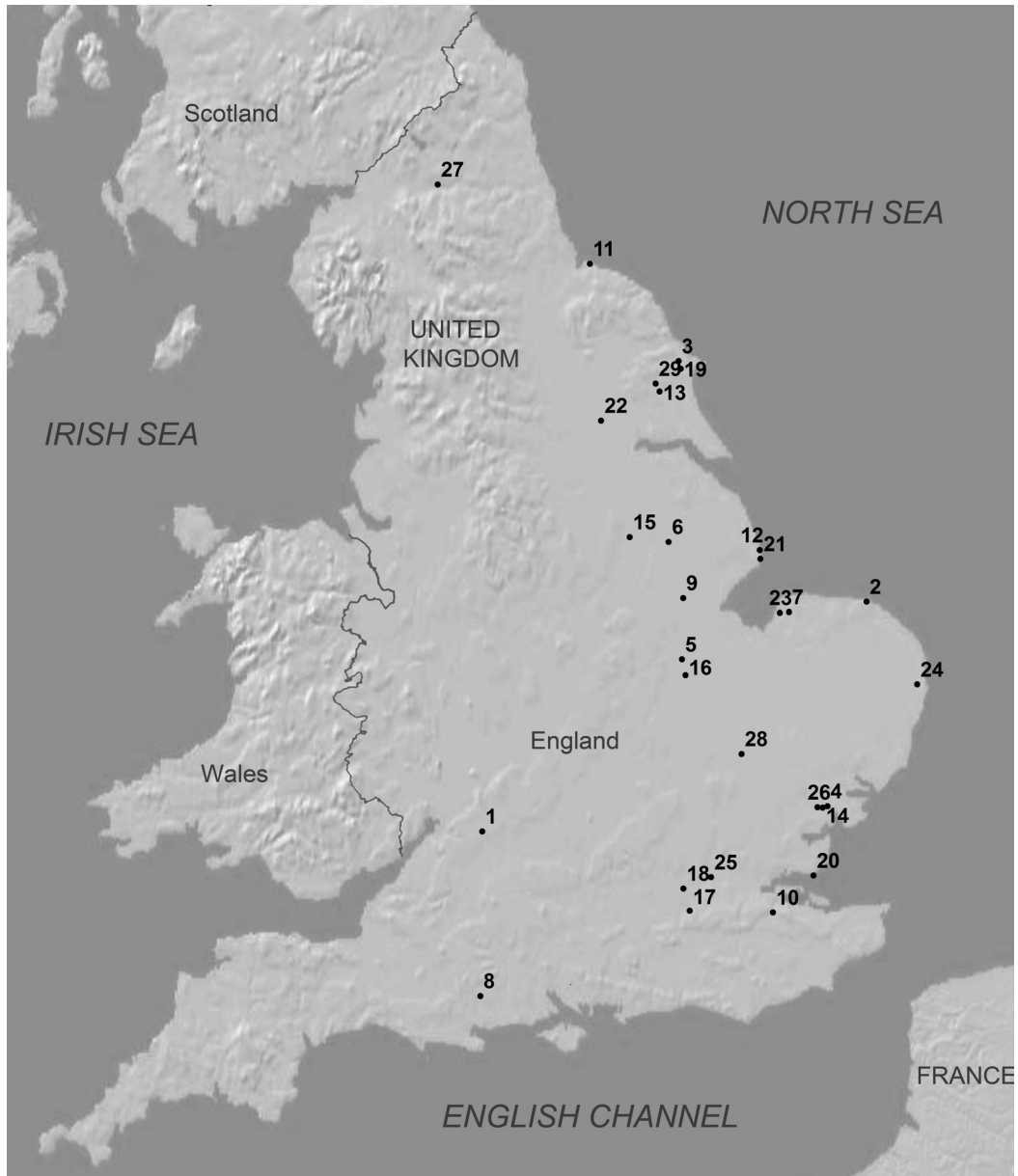
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ENGLAND



Map 22.1. England. Sites mentioned in Chapters 22 and 23:

- | | | | |
|----------------------|--------------------|--------------------|-----------------------------|
| 1 Bagendon | 9 Helpringham | 17 Purberry Shot | 25 Spitalfields |
| 2 Beeston Regis | 10 Holborough | 18 Richmond | 26 Stanway |
| 3 Burton Fleming | 11 Huntcliffe | 19 Rudston | 27 Vindolanda Fort |
| 4 Colchester | 12 Ingoldmells | 20 Shoebury | 28 Wandlebury Hill Fort |
| 5 Etton Woodgate | 13 Kirkburn | 21 Skegness | 29 Wetwang and Garton Slack |
| 6 Fiskerton | 14 Lexden | 22 Skipwith Common | |
| 7 Fring | 15 Newton-on-Trent | 23 Snettisham | |
| 8 Gussage-All-Saints | 16 Orton Meadows | 24 Somerleyton | |

England: Bronze and Iron Ages

Dee DeRoche

Introduction

The focus of this chapter is the Late Bronze Age and the Iron Age, essentially the 1st millennium BC in England, when substantial and numerous changes in settlement pattern and in economic and social organisation occurred. Archaeological evidence demonstrates that textiles were produced and used in the area now known as England for roughly two millennia prior to it becoming a Roman province in the mid-1st century AD (*cf.* Wild in this volume). However, very few examples earlier than *c.* 1000 BC are known. Textile remains in England have come chiefly from hoards and burials (DeRoche 1995, 32), rather than from the houses or working areas where they were produced on settlement sites. Most of the implements and equipment employed in textile production have been recovered from the middens and pits associated with Late Bronze Age and Iron Age occupations, however.

Chronological and Cultural Background

The chronological terminology used here employs a mixture of approximate and absolute dates and the simplified period

designations. The Late Bronze Age spans the period *c.* 1000 to 650 BC. The Iron Age is subdivided into Early (650–350 BC), Middle (350–50 BC) and Late (50 BC–AD 50), which roughly correspond to La Tène I (500–250 BC), La Tène II (250–100 BC) and La Tène III (after 100 BC).

Across all of Europe, including England, in the early 1st millennium BC, new production technologies developed, paralleled by an intensification of agricultural production and fabrication of implements, ornaments and weapons and the appearance of defended sites (Champion *et al.* 1984, 269ff). Throughout the millennium in Britain, among pre-Celtic and Celtic cultures, diverse methods of landscape exploitation were practised at different sites, with variation in means of subsistence as well as location and patterning of settlements (Bradley 1978; Jones 1986), but most production and consumption took place within the family household unit. The rarity with which distinct, recognisable production areas or workshops relating to any craft have been found (Hingley 1990; Parker Pearson 1996) also supports the notion of small-scale, household-based production at this time. Particularly during the Early and Middle Iron Ages, domestic production was the norm, and settlements

were largely self-sufficient in craft production (Cunliffe 1991).

With few exceptions, these settlements were small farmsteads. Subsistence was based on mixed farming, chiefly cereal cultivation and rearing of livestock including cattle and sheep, pigs and horses. These farmsteads were usually detached units of residence rather than part of a group, and were frequently too small to have been self-sufficient in reproduction (of both humans and domestic stock), even if craft and arable agricultural production met their subsistence needs internally (Jones 1986, 112–113). Contact among the dispersed families was necessary for their continued existence. This interdependency of settlements occurred in both valley and upland situations. Population growth and expansion of permanent settlements, which are also evident in this period, meant increasingly widespread interaction among settlements, perhaps in conjunction with the development of regional economic systems promoting frequent interchange among groups.

Settlements became more varied in size and plan during the 1st millennium BC. Hillfort development also marked this period. These enclosures in elevated positions are variously interpreted as refuges, as territorial seats of power, and as central places with specialised production and redistribution functions (Megaw and Simpson 1979, 365–367; Cunliffe 1984a, 556–559; 1984b, 27–28).

In the Late Bronze Age and again in the Late Iron Age, there was a great deal of contact with the Continent as evidenced by cross-Channel trade. During the Early and Middle Iron Ages, especially the period from the 4th to the 1st centuries BC, there was much less interaction (Cunliffe 1991, 405ff). Throughout the millennium, there is a change from egalitarian and undifferentiated social organisation with mostly domestic and agricultural production to a more complex situation with recognizably different social and political groupings. This is seen in the increasingly distinct and specific functions of occupation and other sites, and in the trend toward larger scale and more specialised production of many categories of goods. Bronze working, iron smelting and some ceramic manufacture illustrate this more highly organised mode of production by part-time specialists (Henderson 1991).

At the end of the 1st millennium BC, chiefly in south-eastern England, there were

several new developments: introduction of coinage, urn cremations with grave goods, and growth of *oppida*. These last were places of population concentration at which production beyond the domestic range and scale occurred. However, individual family farmsteads engaged in essentially domestic production persisted here and throughout the rest of England, much as they were at the beginning of the 1st millennium BC.

Research History

The following overview of early textiles from the region is based on *Textile Production in Britain during the First Millennium B.C.* (DeRoche 1995). Earlier examinations of the corpus of British material by Henshall (1950), Hedges (1973) and Bender Jørgensen (1992), as well as reports on finds from specific excavations, including E. Crowfoot (1980; 1991) on cloth from Iron Age funerary contexts in Yorkshire and Wild (1978; 1980) on fabric from saltern sites in eastern England and an Isle of Guernsey burial respectively, provided essential information for that research.

Henshall's comprehensive survey (1950) included descriptions of 37 pieces of fabric and fibres from Pre-Roman contexts throughout Britain, while Hedges (1973) analysed over 80 fragments from Britain and Ireland and the fibres and tools used in their production. From her extensive examinations of early European textiles, Lise Bender Jørgensen has been able to recognise certain combinations of twist, ply and weave patterns as characteristic of the fabrics of Central Europe, Scandinavia or the North European lowlands, evidence that different cultural traditions in textile manufacture existed in these regions. She concludes that Britain does not fit neatly into any of these groups; the heterogeneity of its textiles (Bender Jørgensen 1992, 18–20) points to an overlapping or combination of traditions in spin direction and fibre type.

Fibres

Wool from sheep, and bast fibres from flax, and possibly nettle and hemp plants were the chief textile fibres used in early Britain. The supplies of the wool, flax and nettle fibres used in these textiles may have varied locally, but they were widespread and relatively abundant throughout

England in later prehistory. Moreover, the species from which they were obtained had multiple uses, providing food as well as fibre. The materials for fashioning the implements used in producing thread and cloth were also widely available (DeRoche 1995, 35).

Most of the extant later prehistoric textiles from Britain have been preserved through contact with metal objects, which either inhibited decay or formed replicas of the textiles composed of metallic oxides that replaced the organic fibres (Hedges 1973, 8–10). The identifying characteristics of fibres, such as surface and cell structure, are often obscured in these mineralised textiles, but bast fibres seem to be identified frequently with copper alloys while the majority of textile fibres preserved in association with iron are of wool or hair (Janaway 1987, 136–138).

Textiles and Tools

British textiles of the Late Bronze Age, that is earlier 1st millennium BC, are known chiefly from hoards, while the majority of those of the later 1st millennium BC are from burial contexts. Most of the Late Bronze Age metalwork hoards that include fabrics are from Ireland or Scotland (*cf.* Wincott Heckett in this volume). The single surviving example from England is a small piece of matted, plain-woven linen that was found wedged into the socket of a socketed axe at Somerleyton, Suffolk (Hedges 1973, 212). The thread count is approximately 12 threads/cm and the two-ply thread was s-twisted. A bast fabric fragment in sprang or knotless netting from Etton Woodgate II, near Peterborough (Pryor, French and Taylor 1985, 303), is the only securely prehistoric example of such a technique in Britain.

Iron Age textile remains are known from more varied contexts than those of the early 1st millennium BC, including hoards and salt extraction sites. They come primarily from burials, however, where their preservation has usually resulted from contact with metal artefacts. In a few instances, the likely production site is known. In the case of the Eastern Yorkshire graves at Wetwang Slack, the textiles preserved as metal corrosion products were most probably produced in the adjacent, contemporary settlement excavated by Brewster (1980) and Dent (1982; 1985).

The report on the Wandlebury hillfort excavations mentions a sack or shroud that enclosed the upper half of a child's body recovered from a 5th or 4th century BC pit (Hartley 1957, 15). This fabric did not survive and, based on the *in situ* photograph (Hartley 1957, Pl. III c), seems to have been little more than a soil stain. Brewster remarks on deposits in several burials at Garton Slack, Humberside, noting material described variously as "fine", "sooty", "black and soft", "fibrous" and "carbonised" (Brewster 1980, 153, 155, 232). Some of these deposits may have been the remains of cloth. Three La Tène swords are among the items salvaged from old beds of the River Nene during gravel extraction at Orton Meadows, near Peterborough, between 1980 and 1982 (Stead 1984, 6). Two are of La Tène I style, equipped with scabbards; the third is of La Tène III type. Iron corrosion products on one of the La Tène I pieces have preserved traces of an adjacent textile, in 2/2 twill with one s-twisted and one z-twisted system, illustrating that the combination of spin directions in a weave was not a Roman introduction to Britain (Wild and Bender Jørgensen 1988, 1).

Warrior burials from the Channel Island of Guernsey have also produced evidence of La Tène textiles. Fragments of a mineralised plain weave probably in linen adhered to a La Tène III sword from Richmond. The threads are s-twisted and number approximately 11 and 13 threads/cm in warp and weft (Wild 1980). This twist direction is more usual in Scandinavia (*cf.* Mannering *et al.* in this volume) than in Britain and adjacent continental regions during the Pre-Roman Iron Age (Bender Jørgensen 1992, 20, 120–121). Wild (1980) suggests, from the oblique positioning of the fibres on the blade, that the sword may have been wrapped for protection (*cf.* Grömer in this volume). The z-twist on the two plain weaves from St. Peter Port, Guernsey, is more typical of British textiles of the period. A warrior burial excavated there in 1982 included heavily corroded iron objects, on three of which, a sword scabbard, shears and a fibula, were mineralised traces of two different bast fibre fabrics, with thread counts of approximately 5/5 and 8/12 threads/cm (Watkins and Cameron 1987, 53, 55).

From a barrow at Skipwith Common, Yorkshire, comes a wool textile in broken diamond twill weave, which testifies that this type of weave first appears in Britain in the

La Tène period (Henshall 1950, 138; Bender Jørgensen and Walton unpublished). The fabric has 5–6 z-twisted threads/cm and is rather matted, probably due to deliberate fulling. Although heavily stained, some 20–30% of the fibres appear to be slightly pigmented. A fringe of warp threads has been formed by binding groups of ends with a crochet-like stitch.

The textiles preserved as iron replacement products in the La Tène burials at Burton Fleming and Rudston, East Yorkshire (Crowfoot 1991, 124–125), include at least one additional diamond twill weave. These inhumations of the La Tène period belong to the square barrow tradition of the Yorkshire Wolds, the Arras culture, long known from early excavations and crop marks and the object of extensive research (Stead 1979; 1991). The burial rite defined the positioning and orientation of the bodies and the selection of grave goods, which usually included a joint of meat plus either jewellery, most often a brooch, or tools or weapons. In the great majority of cases, it was through contact with the iron brooches that textiles were preserved. The positioning of the brooches at the chest or shoulder of the deceased suggests that they secured an outer garment. Fifty-seven of the burials at Burton Fleming and Rudston have revealed traces of fibrous remains, nearly all of which appear to have been of wool (Crowfoot 1991). The preserved textiles, which number 50 to 55 depending on the interpretation of fragments, are chiefly twills and a few plain weaves, usually of low thread count and z-twisted, although about one third may include both s- and z-twisted yarns. The yarns were generally coarse and often very unevenly spun. Only occasionally were these yarns plied. Some fragments show the tablet-woven starting borders typical of warp-weighted loom construction.

Among the Burton Fleming and Rudston textiles, the weave with the highest thread count is a textile from burial BF20 (Crowfoot 1991, 119–120, 125). The fabric was a twill woven of uneven yarns of mixed spinning, 9–11 threads/cm, with an elaborate border. The border was composed of a band in plain weave with closely packed weft (13–14 threads/cm) alternating with a checked pattern created on the intervening areas of twill by needle-inserted threads, the earliest embroidery known in Britain. Use of threads of different

spin directions in a pattern of stripes, which would have been hardly noticeable if worked in monochrome wool, suggests that these threads were of contrasting colours and may have been dyed (Crowfoot 1991, 121). The techniques employed in this piece are complex and subtle, but not especially skilfully executed.

At nearby Kirkburn, in Burial K5, two wool twills were preserved between the warrior's body and his coat of iron mail (Crowfoot 1991, 122). The coarser fabric, entirely z-twisted with variable thread count (9/10 to 7/8 threads/cm) was nearer the body and probably represents a tunic or gown. The finer fabric, varying from 12–14 to 9–10 threads/cm in mixed spinning, may have been a cloak woven of wool fibres, which had been aligned and tightly twisted. These weaves are similar to those of Burton Fleming and Rudston, although somewhat finer than all but the embroidered piece from BF20.

Other mineralised textiles of the La Tène period are known from cart burials under square barrows in eastern Yorkshire. Three of these burials were discovered in 1984 during gravel extraction at Wetwang Slack, a shallow dry valley known for extensive open settlement and cemeteries of the Iron Age (Dent 1985). Here, all the textile preservation was the result of contact with bronze artefacts, and Crowfoot suggests (1991, 120) that, as the preservation of flax seems to be favoured by contact with bronze, these Wetwang cart burial textiles may illustrate a component that has not been preserved on the iron ornaments and implements at Burton Fleming, Rudston and elsewhere. An alternative explanation attributes the finer quality of the textiles, seen in higher thread counts (approximately 8/8 to 10/12 threads/cm), to the elevated status of the deceased in these cart burials. In addition to several plain-woven fragments and two possible examples of 2/2 twill, chiefly in mixed spinning, a probable tablet weave, somewhat damaged, was identified on the mirror in burial no. 2. The plain weaves, for which flax is more suited than for twill, account for a higher proportion of the textiles from the Wetwang Slack cart burials than at the cemeteries of Burton Fleming, Rudston and Wetwang Slack. This Wetwang group also includes more textiles woven of yarns of mixed spinning than is usually the case (Crowfoot forthcoming).

The Wetwang Slack cart burials occurred

within the zone of square barrow inhumations and open settlement that distinguished the valley of Garton Slack and Wetwang Slack (Brewster 1980; Dent 1982; 1985). Wetwang Slack inhumation graves produced some mineralised fibres from textiles, all in contact with iron objects (Crowfoot forthcoming). These 27 textiles all appear to be of wool, but the weave surfaces are too deteriorated and the remaining fragments too small to ascertain more details. Most of the threads are coarse and z-twisted, thread counts appear to be between 4 and 6 threads/cm, and the weaves, where discernible, are 2/2 twill. Although examples cover a period from the Middle Iron Age into the 1st century AD, there are no significant chronological differences in the textiles preserved. The Burton Fleming and Rudston textiles were more varied, with plain weaves and twills (some with pattern reverses), and better preserved than the sample from the Wetwang Slack graves. The textile remains from Wetwang Slack are especially significant because of the possibility of relating them to the adjacent open settlement of roundhouses at Garton Slack (Brewster 1980), where at least some of them could have been produced.

In the period when contact with Rome increased the possibility of the introduction of textiles from distant sources to Britain, the place of manufacture of those fabrics recovered must be considered. The centre of native power at Camulodunum (Colchester, Essex) attracted exotic imports of many materials, as shown by the contents of the nearby Lexden tumulus (Laver 1927; Foster 1986) and a warrior's grave at Stanway (Crummy 1992–93), both aristocratic burials of the mid-1st century AD relating to the settlement at Camulodunum. The fragments of gold “cut bright plate” recovered among the Lexden burial offerings may have been made into gold thread by wrapping the thin ribbon of beaten gold around a core of silk thread that has now decayed (Wild 1984, 20). The context of these pieces of gold suggests that they may have decorated a garment that has not itself survived (Foster 1986, 92–94). Among the objects included in the Stanway warrior's burial (Crummy 1992–93) was a copper alloy jug on which were preserved traces of a 2/2 herringbone twill textile (Wild 2007).

Most of the textiles on a bed in a Roman military building at Colchester were also of

2/2 twill. In addition, a band of diamond twill and some plain weave had also been preserved there. All three fabrics were carbonised in a fire at the beginning of the civilian phase of the *colonia*, possibly during Boudicca's rebellion of AD 60 (Wilson *et al.* 1973, 302). It is likely that these fabrics were of Roman manufacture, but nothing about them precludes their having been produced in one of the provinces, perhaps even in Britain. The coin hoard from Fring, Norfolk (Chadburn and Gurney 1991), may also relate to the period of unrest in the mid-1st century AD, if not directly to Boudicca's uprising. The pattern of creases in the cloth recovered with this hoard indicates that it was probably tied over the mouth of the wheel-turned pot that contained Icenian coins (Liu and Crowfoot 1991). It was a plain weave of plant fibre, possibly flax or hemp.

Textile impressions in fired clay are a further source of information on fabric manufacture. Their size is frequently no larger than fingerprints, which may have created the impressions. While weave pattern is sometimes discernible and thread count may be estimated, it is rare for details of construction beyond the occasional indication of spin and ply direction to be evident. These impressions generally record a fairly coarse tabby, of 5 to 10 threads/cm. Dating is often uncertain, particularly at saltern sites from which several such impressions are known, since it is often difficult to distinguish between prehistoric and Romano-British salt making activities.

A concentration of Iron Age salterns occurs at Helpringham, Lincolnshire. The Helpringham Fen textile impression on *briquetage* (fired clay containers and supports used in salt extraction) is of a relatively coarse tabby (Kirkham 1985). Other tabby impressions were found on prehistoric *briquetage* from coastal Ingoldmells (Kirkham 1975, 42) and Skegness (Wild 1978). The fired clay fragments with textile impressions from Shoebury, Essex, demonstrate a finer tabby, of 10–12 threads/cm (Laver 1911, 220). The thickness and mottled appearance of these sherds suggest that they may have been part of a mould (Nigel Brown, pers. comm. 1992). Another coarse tabby impression has been identified on a pot of *c.* 300 BC from Purberry Shot, Surrey (Henshall 1950, 135).

Fibres which have not been woven into cloth represent another informative source for our understanding of the types of raw

material available and chosen, and, in some cases, the preparation processes which were used. A Late Bronze Age hoard from Beeston Regis, Norfolk, contained string of lime bast (John Peter Wild, pers. comm. 1990). Another Norfolk hoard, one of the Snettisham finds dated to c. 70 BC, included one broken bronze torc that “had been tied up with string made of willow fibre” (Stead 1993, 102). Wool threaded through a small piece of bone was recovered at Bagendon, a Gloucestershire *oppidum* (Clifford 1961, 271). Fibre impressions are visible on the interior of one of the fired clay moulds for metalworking from Gussage-All-Saints. These fibres seem to be crossed, but not interwoven (Crowfoot 1980).

These artefacts demonstrate that fibres were used for other purposes than making woven textiles. Cords and strings for attaching and binding, nets for catching and carrying, padding and wadding for tighter, more secure and comfortable fits, multiple layers for extra warmth or protection, are just some of the possible uses for fibre other than in creating fabrics. Ceramic impressions give us little information about the structures and characteristics of the textiles, but show that textiles were frequently on hand in situations where ceramic objects were being produced.

Components of the textile tool kit used in procuring and preparing fibre, for spinning and weaving it, and in the finishing processes are more likely to survive in the archaeological record than the textiles themselves, being composed of stone, clay, bone and metal. These include spindle whorls and loom weights of ceramic and stone, points, pins and needles of bone and metal, long-handled antler combs, and metal shears. Looms have not been recovered from prehistoric England. A better understanding of textile production could be gained from further analyses of these implements’ functions and their geographical and chronological distributions.

Conclusions

From the preserved textiles, we know that wool and plant fibre (mostly flax) were the most common fibres used for textiles in England during the 1st millennium BC. It is assumed that these fibres were locally available for collection or production. Tabbies, mostly of z-twisted yarn, were typical of the Late Bronze

Age. S-spinning became more common during the later periods, but z-spinning persisted, s- and z-twisted threads sometimes being combined in one fabric. Twill weave in several variations came into use from the Early Iron Age, but tabby, both coarse and fine, continued. Textiles recovered from Iron Age contexts are more varied and complex in structure than those known from the Bronze Age.

The numerous loom weights recovered from many settlements are strong evidence for the use of the warp-weighted loom throughout prehistoric England. Fragments of tablet weave, *e.g.* from a Wetwang Slack cart burial, suggest that this technique was also known. The two-beam vertical loom was probably used as well. Long-handled antler combs become increasingly common over the millennium, as do needles. The iron shears indicate that non-moulting sheep were supplying wool during the last centuries before the Common Era. Basic production techniques did not change, although the wool supply may have increased (DeRoche 1995, 178). Specialisation evidence is lacking in the types and distribution of the implements of the textile tool kit. While some textiles, for example the elaborate embroidered border from burial BF20 at Burton Fleming (Crowfoot 1991, 119–120, 125), demonstrate great skill in planning and execution, the quality of fabrics remains very variable, even during later prehistory.

In the absence of any concrete evidence to the contrary, it seems likely that weavers were supplying only local needs, perhaps only those of their own households, prior to the Roman conquest (DeRoche 1995, 181). Although other crafts, such as bronze and iron working, glass manufacture, and in some instances pottery making, were practised by specialists in dedicated workshops, spinning and weaving were among the many production activities that took place within most households across England throughout prehistory.

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England: Roman Period

John Peter Wild

Introduction

The incorporation of Britain into the Roman Empire in AD 43 was a political and military development that put an end to the Iron Age – or so one might imagine from reading the accounts of Roman historians and those who have followed them in later centuries (Collingwood 1945, 4–13). Today, in the post-colonial era, we take a more nuanced approach, but one that admits of varying opinions. To what extent, one may ask, did the textile-making traditions of the Iron Age continue into and through the four centuries of ‘Roman Britain’, and how were they modified or transformed by new external influences?

Chronological and Cultural Background

Julius Caesar’s summer expeditions to Britain in 55 and 54 BC were acts of self-promotion, but served to enhance the mutual awareness of Britons and Romans (Creighton 2006). Claudius’ full-scale invasion of AD 43 gradually brought what is now England and Wales under Roman military control and political authority, but it was not until AD 122 that Hadrian defined the northern frontier of the new

province with a wall that remained, despite some short-lived advances into Scotland, Rome’s northern limit until *c.* AD 410.

While northern England and Wales remained a military zone secured by a network of metalled roads and forts (Frere 1999, 49–183; Bidwell and Hodgson 2009), the civil province south-east of the Fosse Way road between Lincoln and Exeter developed some well-tried Roman institutions. Each former Iron-Age tribe was encouraged to build a town to act as an administrative and market centre, an urban concept new to the Britons (Jones 2004). Smaller towns sprang into life, too, driven by economic or religious factors (Burnham and Wachter 1990; Millett 1990, 65–91). The countryside saw the spread of villas, well-appointed homes at the centres of farming estates (Rivet 1958; King 2004; Taylor 2007). Coinage and a market economy became part of provincial life, and trade links facilitated the arrival of a new range of material culture (Jones and Mattingly 1990, 179–232; Fulford 1991). The Iron-Age aristocracy became the new urban elite and villa-builders.

Military resistance to Rome’s advance was strong in Wales and southern Scotland in the 1st century AD, but known revolts thereafter are few. The subject Britons and governing

Romans reached an accommodation: its exact nature is a topic of on-going debate. The one-sided concept of 'Romanization' (Millett 1990, 1–2) has given way to studies of identity (Mattingly 2002; 2005) and recognition of the possibility of 'creolisation' (Webster 2001). A society with its own Romano-British character developed with time, distinct from, but drawing upon, both native British and Roman cultural traits (Woolf 1998).

Britain remained nevertheless a relatively backward province compared to Gaul or Spain (*cf.* Alfaro in this volume). The 'epigraphic habit', such as the erection of inscribed and sculpted tombstones did not extend far beyond the ruling class. The distribution of villas in the Cotswolds may look impressive – but they lack the density and architectural pretension of their counterparts in the Somme Valley near Amiens (Agache 1975). More indicative of the provincial state of mind perhaps is the extent of language penetration. Vulgar Latin, the Latin of the street, is attested in some towns (Tomlin 2008), and many provincials may have been bilingual in Latin and insular Celtic (Adams 2008). Latin did not replace Celtic, however, as it had done on the Continent (Rivet and Smith 1979, 13–14; Jungandreas 1979; Schmidt 1992), and that is highly significant.

Research History

Audrey Henshall (Henshall 1950; 1962) and Elisabeth Crowfoot (*e.g.* Crowfoot 1991) were the pioneers in the study and publication of prehistoric and early historic textiles from Britain. Dee DeRoche discussed in her doctoral thesis the evidence for tools and textiles in Iron-Age Britain (*cf.* DeRoche in this volume). In 1970 the present author published an account of tools and textiles from Roman Britain, updating that study in 2002 (Wild 1970; 2002). He also reviewed in 1979 the possible impact of incoming Roman textile technology on the Iron-Age substrate (Wild 1979).

Dress and Fashion

The aim of the discussion below is to address a specific issue: how conservative were the textile producers of Roman Britain, and how long and successfully did they keep alive the traditions of the Iron Age?

The principal end-product of their labours, clothing, may offer the first clue. In common with language, clothing is an expression, conscious and unconscious, of the identity of the wearer: spinner and weaver provided the means to fulfil that expression, and conservatism in the one domain could be expected to match conservatism in the other.

Study of Roman funerary reliefs along the Rhine and Danube frontiers has revealed strong evidence for the survival of distinctive local – arguably Iron-Age tribal – clothing fashions among some women until at least the early 2nd century AD (Wild 1985, 395–399). A standard component of Iron-Age attire was a tube-like over-tunic which was pinned on each shoulder with a brooch. In Britain, the sculptural evidence is less explicit, but the copper-alloy bow brooches which secured the over-tunic are frequent finds (Wild 1985, 396–397). A high proportion of them, particularly in the 2nd century AD, incorporate a loop projecting from the head (Bayley and Butcher 2004, 159–170); for they were worn in matching pairs, and the ends of a chain or string of beads could be attached to the loops (Wild 1968, 207 Abb. 26). Distribution maps indicate that bow brooches with head-loops were worn not just in the less urbanised military north of the province, but in the south-east, too (Bayley and Butcher 2004, fig. 173). Production of such brooches, however, ceased in Britain soon after AD 150: that may mark the demise of overtly Iron-Age dress styles, too (Mackreth 2009, 145), although D. F. Mackreth points out (*pers. comm.*) that pairs of penannular brooches may subsequently have taken over the role of the bow brooches.

In the light of such fashion conservatism, it is fair to argue *a priori* that significant elements of the British textile industry may well have continued as before: nonetheless, incentives to change and modernise ultimately emerged, too strong to ignore.

Materials, Tools and Processes

The principal raw material in Britain from late prehistory until relatively modern times was wool. It has been suggested that 'the Romans' introduced new strains of sheep with superior fleeces into the province (Wild 1982, 113–114); that is likely, but direct evidence is lacking. Interestingly, the spectrum of wool

types recognised in the textiles from the Roman fort at Vindolanda dated *c.* AD 100 (see below) seems not to be radically different from that recorded for the textiles from the Hallstatt salt mines of the 8th to 6th centuries BC (Wild 2002, 2; *cf.* Grömer in this volume). Recent reappraisal of the interpretation of fibre diameter measurements, however, has drawn attention to the key roles played by wool sorting, and by the different methods of fibre harvesting, in the composition of spun yarn (Rast-Eicher 2008, 150–155). The broad comparability between the Hallstatt and Vindolanda yarns may nonetheless be instructive: Vindolanda after all was founded barely 20 years after the Roman conquest of northern Britain and is likely to have relied on local sources for much of its clothing and textiles.

The key to achieving higher quality wool is selective breeding, but it is not clear whether small farmers in Roman Britain – for example in the newly settled fenlands of eastern England – culled their rams and managed their flocks under a sufficiently strict regime. On villa estates, however, more enlightened policies may have been followed (Wild 2002, 3).

The apparently primitive practice of plucking sheep probably continued in Roman Britain alongside shearing with sprung iron shears. Plucking has the advantage of harvesting the finer short-stapled underwool in the fleece rather than the coarser longer outer hair: the result tends to be a generalised medium wool yarn rather than a hairy medium yarn, both typical of Roman Britain. Shearing, however, recovers the whole fleece, and the appearance of flat iron wool combs in the province by the 3rd century AD indicates the need to separate long from short fibres for the spinning of different types of yarn (Rast-Eicher 2008, 150–157, 161–162; Wild 1982, 117–118).

If the Romans promoted changes in the cultivation and character of other fibres, such as flax, or in the techniques of spinning, we have no evidence of it. But for weaving there is more to be said.

Frequent finds of the heavy clay triangular loom weights typical of Iron-Age Britain and parts of the near Continent attest the widespread use of the vertical warp-weighted loom in pre-Roman Iron-Age Britain (Elsden and Barford 1996; Mackay 2000). Their occasional discovery in sets allays earlier doubts

about their function (Wild 1984; Fasham 1985, 90). They occur on Roman sites, too, usually in fragments; but particularly on multi-period sites they have often been dismissed as residual (*e.g.* Mackreth 1988, 98–99). The classic Roman loom weight is pyramidal, better fired, smaller and lighter (Wild 1970, 63, 156). Triangular loom weights have been found, however, in sound Roman contexts; at Newton-on-Trent (Lincolnshire) there is even a suggestion of manufacture in the 2nd century AD (Field and Palmer Brown 1991, 49, 51).

The change through time of the loom weight's shape and weight is not necessarily proof of a radical change in the form of the warp-weighted loom; for significant differences in weaving practice have been recorded between communities where a similar implement was, or still is, in use (Hoffmann 1964, 23–150; Stærnøse Nielsen 1999). More problematic for Roman Britain is the apparent dearth of finds of pyramidal loom weights, although their number has increased marginally since 1970 (Wild 1970, 63, 136; *cf.* Stanwick 1987, 335). The *argumentum ex silentio* that would see the introduction into Britain of the two-beam vertical loom (lacking loom weights) is not entirely satisfactory (Wild 2002, 11).

The traditional tool for beating up the weft on a warp-weighted loom was the weaving sword, usually of wood (Hoffmann 1964, 279–283); but there is no unequivocal trace of it in England until the Anglo-Saxon period when modified iron swords are among the furnishings of the graves of well-to-do females (Walton Rogers 2007, 33–34, 44, 45; Harrington 2008).

Archaeologists have long regarded three specific bone implements as weaving tools: a short-handled narrow bone or antler comb ('weaving comb'; Tuohy 1999), an ovicaprid tibia or metatarsal trimmed diagonally at one end ('bone gouge' or 'pin-beater'; Wild 1970, 66; 57 unpublished examples have been found at an Iron-Age causeway at Fiskerton, Lincolnshire), and a similar bone, unworked except for a hole drilled through the shaft in the centre ('bobbin'; Wild 1970, 66). Discussion has ebbed and flowed about their functionality and fitness for presumed purpose; but the case for accepting them as textile tools is too weak to be convincing. The frequent occurrence of bone 'weaving combs' at military sites along Hadrian's Wall may be noted in passing

(Allason-Jones 1989, 18), but merely serves to strengthen our impression of northern conservatism.

Textiles

Many of the leading families of south-eastern Britain made a successful transition from being Iron-Age to Romano-British notables, losing their political muscle but not their socio-economic influence. The possibly royal chamber tomb at Lexden (c.15–5 BC) near the *oppidum* of Colchester was furnished with Roman diplomatic gifts including a textile decorated with fine gold and perhaps purple tapestry (Foster 1986, 92–95, pl. 21). Dating to the time of the conquest or shortly after (c. AD 40–50/55) three graves in a group of aristocratic burials at Stanway, just west of Colchester, each contained a fine 2/2 twill cloak or blanket in wool (Wild 2007a). All three were probably diamond twill, with z-twisted warp, s-twisted weft and thread counts of 20–25/20–25 threads/cm. One had a soft nap (BF64), one an apparently blue-purple dyed warp (CF47) and in both cases the textile had been spread over the array of grave goods. The three twills are considerably finer than any of the East Yorkshire examples described in the previous chapter; but they lack the elaborate embroidered twill border of BF20 from Burton Fleming (Crowfoot 1991, 120, fig. 79A), itself an apparent echo of the continental *Prachtmantel*. The Stanway fabrics highlight the skills of the eve-of-conquest weavers.

The fort of Vindolanda in Northumberland was founded in c. AD 85, barely a decade after northern Britain came under Roman control. Fragments of some 600 wool textiles (Fig. 23.1) that were supplied to its garrisons over the next twenty years have survived: a high proportion of them, it may be argued, are the products of weavers working in the Iron-Age tradition, both locally and in the Rhenish homelands of the troops. Over 60% of the assemblage is in 2/2 diamond twill, mirroring the rise in popularity of this weave structure across north-west Europe (Bender Jørgensen 1992, 124–125, 133–135; Wild 2002, 20). The Vindolanda diamond twills show z-twisted warp, s-twisted weft and a slightly higher warp than weft count. A wide range of repeat patterns has been recorded, but a reversal of weave direction after 10 warp threads and 9 weft threads seems to

be standard, at Vindolanda as across much of prehistoric Europe (Bender Jørgensen 1992, 24, 134). Fabric weights vary considerably: some are as fine as the Stanway pieces. Decorative techniques typical of the Iron Age appear at Vindolanda, too: check patterns and stripes achieved by using contrasting coloured yarns or yarns of contrasting spin direction (Wild 1977, 29 no. 10; 27 nos 28, 37, 39 and other, unpublished, pieces).

Weaves other than diamond twill seem intrusive in this context. A handful of 2/1 twills, source unknown, may stem from military cloaks (Granger-Taylor 2008, 13–14). Some 14% of the corpus are light-weight fabrics in basket weave or half-basket weave, often with reinforced selvages over warp bundles and twisted-cord transverse borders (Wild 1993, 78 and unpublished pieces). The small number of fragments with tapestry-woven decoration – notably T545 from a light cloak – stand out as Mediterranean in inspiration (Wild 1992), as do the scraps of blue sleeping mat with Ghiordes knots (Wild 2007b). Iron-Age in inspiration, however, must surely be the plaited cap made from local hairmoss (Wild 1994) and the extraction of red and purple dyes from bedstraws and lichens (Taylor 1983, 123–124).

Only in the Vindolanda corpus is the juxtaposition of Iron Age and Roman so striking. The scattered individual finds of later date from the province give a more blurred impression. The stout 2/2 herringbone twill from a late 4th-century AD well at Huntcliffe (East Yorkshire) would not have been remarkable at Vindolanda (Wild 1970, 97 no. 43); but the imported damask silks found at Spitalfields (London) and Holborough (Kent) (Wild 1970, 101) belong to another world.

Conclusions

The conservatism discernible in several significant aspects of life in Roman Britain, discussed in the opening paragraphs, encourages the suggestion that five or more generations of spinners and weavers in the province retained the technical practices and predilections of the Iron Age, until at least the later 2nd century AD. By the mid-3rd century AD, however, they would probably have responded to the arrival from the Mediterranean of new clothing fashions incorporating rich tapestry-woven



bands and panels (Wild 1985, 413), and acquired the craft skills to reproduce them. If a true Romano-British textile technology emerged, reflecting both the Iron Age heritage and the new influences from the Roman heartland, we cannot yet recognize it among the finds which have come to light so far – perhaps because we are not sure what to look for. Its most likely symbols, however, may be the hooded capes (*birri*) and wool rugs (*tapetia*) made in Britain and highly rated in Diocletian's Price Edict of AD 301 (Wild 2002, 1).

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Fig. 23.1. Textile from the fort of Vindolanda (Photo: J. P. Wild).

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Index

- Abora (Latvia) 265, 268–270
acidic
 dye 18
 environment 2, 92, 215
 mordant 18
accessory 102–103, 105, 113–114
Adriatic Sea 202, 214, 216–217, 243, 294
Aegean Sea 183, 186–187, 189, 194, 224, 335
Aegina (Greece) 184, 196
Aeolian Islands 204
Africa 261, 336
Agia Kyriaki (Greece) 184, 194
agriculture 67, 78, 92, 267, 276, 293, 350, 399–401
Aigaleo (Greece) 184, 196, 199
Akershus (Norway) 274, 278–279
Akrotiri (Greece) 183, 185–189
Alans 401
Alexandria (Egypt) 343
Alfedena (Italy) 214, 225, 230
Alianello (Italy) 214
alizarin 19, 46, 104, 279, 284
Almdorf (Germany) 121, 133
Alps 27, 28, 54, 65–68, 78, 84, 139, 142, 145, 149, 167, 203–204, 218, 229, 308, 378–379, 386, 388, 391, 395
Altai Mountains 414, 418
Altdorf (Germany) 121, 127
Altinum (Italy) 85
Alt Stassow (Germany) 152, 156
alum 19, 71, 405, 409, 414
Alzey (Germany) 152, 167, 169, 173
amber 10, 67–68, 78, 94, 102, 168, 229, 230–231, 235, 243, 245, 247, 249, 251, 267, 270, 429–430
Ampelakia (Greece) 184
Ampurias (Spain) 335
Anatolia v, 9, 126
Ancona (Italy) 214, 222, 224
Andronovo culture 400
animal
 bones vii, 222, 267–268, 312, 356, 362, 379, 381, 383, 416, 429, 432
 fibre 2, 3, 5–9, 28, 126, 135, 143, 189, 206, 218–219, 270, 309, 317, 381–382, 414
 gut 410, 415
 husbandry 94, 221, 267, 276–277, 293, 336, 350–351, 399, 430
 skin/fur 48, 91, 94, 102, 105, 114–115, 384, 432, 435–436
Ano Voula (Greece) 184, 199
anthraquinone 104
Apennine
 culture 204, 216, 224
 Mountains 243
 Peninsula 204, 205, 211, 215–216, 219, 224, 227
apigenin 32, 43, 104
appliqué 4, 17, 157, 172, 242, 247, 249, 251, 407–408, 418–419
Apremont (France) 262
Aquarossa (Italy) 214, 236
Aquilaia (Italy) 65, 68, 80, 214
Arbedo (Switzerland) 366, 379
Arbon-Bleiche (Switzerland) 366, 370, 379
archaeobotany vii, 67, 126, 221, 268, 379, 402, 431
archaeozoology – *see* animal bones
Archaic period 182, 187, 194–195, 201, 235, 237
Ardnaglug (Ireland) 427, 430
Argaric culture 335, 339–340
Argyroupolis (Greece) 184, 199
aristocracy 47, 57, 139, 186, 216–217, 243, 249, 252, 277, 420, 428–429, 439, 448, 451, 454
armour 230, 430, 440
Arnitlund (Denmark) 90, 112, 114
Arras culture 447
asbestos 8, 11, 168, 219, 223
Asia 400, 418
 Central 406
 Minor 78, 222, 308
Asperg (Germany) 121, 127, 131
Athens (Greece) 183, 184, 186–187, 193–195, 197–198
Atlantic Ocean 308, 338
Attergau (Austria) 26, 30, 42, 44, 45, 49, 52
Augsburg (Germany) 152, 167, 169
Augustus 66, 73, 187, 336
Aunjetitz culture – *see* Únětice culture
Austria vi, vii, 2, 25–88, 124, 125, 169, 205,

- 229, 262, 297, 308–310, 312, 321–323, 327, 356, 379
 Auvernier (Switzerland) 366, 357, 369, 370, 375, 378
 Avars 296, 309
 awl 416
 Azov Sea 399
- Bad Frankenhausen (Germany) 121, 126–127, 130, 133
 Bad Kreuznach (Germany) 152, 169
 badger 127, 141–142, 144, 384, 386, 432
 Badow (Germany) 152, 156, 158–159
 bag 32, 41, 42, 105, 114, 175, 284, 380
 Bagendon (England) 443, 449
 Balkans 75
 ball of yarn 16, 205–206, 208, 220, 310, 370
 Ballinderry (Ireland) 427, 431
 Ballyveelish (Ireland) 427, 431
 Ballyvourney (Ireland) 427, 431
 Balmaclellan (Scotland) 427, 437
 Baltic Sea region 92, 243, 266–267, 350, 430
 band 11, 13, 30–32, 34, 42–46, 49, 54–55, 73, 82, 103, 126, 128, 130 135, 141–145, 147, 149, 157, 161–162, 167, 177, 188–189, 194, 196, 206, 233, 236, 254, 256–262, 269, 271, 278–289, 293, 296, 318, 323, 326, 343, 360–363, 384, 390, 416, 432, 434–435, 439, 447–448, 455
 Barche di Solferino (Italy) 202, 204, 208, 213
 Barnstorf (Germany) 152, 158
 Baronstown West (Ireland) 427, 436–437
 Basel (Switzerland) 366, 378–379
 basic
 dye 18
 environment 2, 215
 mordant 18
 basket weave 12, 31–32, 40, 43–45, 55, 132, 157, 163, 171, 175, 317, 319–320, 411, 454
 basketry 1–2, 94, 144, 204–205, 207–209, 211, 270, 306, 310, 338, 379–381, 335, 338, 241–342
 Basovs'ke Horodyshche (Ukraine) 398, 407
 bast fibre 5–6, 27, 32, 42, 51, 94, 115, 126–127, 141–144, 167, 173, 189, 199, 204–207, 209, 211, 219, 270, 279, 336, 338, 368–369, 380, 383, 403, 407, 413, 432, 445–446, 449
 Bastheim (Germany) 121, 131
 Baunso (Denmark) 90, 108–109
 Baza (Spain) 333, 335, 342
 bead 17, 129, 130, 133–134, 167, 229–230, 247, 249, 251, 286, 429–431, 434, 436, 452
- Beaker culture 378–379
 beater 16, 68, 71–72, 73, 75, 169, 259, 261–262, 363
 Beckov (Slovakia) 305, 307, 322
 bedstraw 454
 Beeston Regis (England) 443, 449
 Behringen (Germany) 121, 127, 130
 Behringersdorf (Germany) 121, 129
 Beilngries (Germany) 121, 131
 Bell Grave culture 294
 Bellinzona Castel-Grande (Switzerland) 366, 378
 belt 11, 47, 49, 82, 97, 101, 105, 114, 131, 133, 160, 161, 205–206, 222, 230, 254, 275, 278, 315–320, 334, 340–341, 419
 Bēne (Latvia) 265, 269–270
 Benestad (Sweden) 348, 355
 Bentstreek (Germany) 179
 Berdians'kyi Kurhan (Ukraine) 398, 421
 Berezan' (Ukraine) 398, 401
 Bergisch-Gladbach (Germany) 152, 163
 Bern (Switzerland) 366, 377, 394, 395
 Bescheid (Germany) 121, 131
 Besh-Oba (Ukraine) 398, 407, 414, 416
 Betaghstown (Ireland) 427, 436
 Biely Kostol (Slovakia) 305, 313
 Bilozers'ka culture 400
 Bils'ke Horodyshche (Ukraine) 398, 401, 407, 416
 birch 310, 380
 bark 139, 270, 353
 bast 368
 Birka (Sweden) 348, 353
 Biskupin (Poland) 292, 294–297
 black 20, 43, 55, 79, 104, 145, 187, 280, 392, 409, 412–413, 446
 Black Sea 187, 399–401, 408–411, 413–414, 419
 blanket 84, 105, 110, 135, 242–243, 282–283, 286–287, 289, 454
 bleaching 17, 236
 Blievenstorf (Germany) 152, 158
 Blindheim (Norway) 274, 278, 280
 blouse 47, 97, 101, 110, 130, 133, 436
 sleeveless 110
 Blučina (Czech Republic) 305, 319, 321
 blue 18, 20, 32, 43, 46, 55, 84, 104, 110, 127, 141–142, 145, 147, 179, 157, 159–162, 167–168, 223–224, 249–250, 255, 271, 279, 280, 282–284, 287, 299, 360, 407, 409, 454
 Blyznets' 2 (Ukraine) 398, 415, 420
 Boat-Axe culture 267
 bobbin 68, 156, 159, 312, 453
 Bodenheim (Germany) 152, 168
 Bodman (Germany) 121, 127
 bog body 105, 113, 132, 133, 135, 161
 Boki (Latvia) 265, 271
 Bolkilde (Denmark) 90, 94, 95
- Bologna (Italy) 54, 57–58, 214, 230, 232–233, 235–236, 243, 251–252, 258
 Bolotne (Ukraine) 398, 403
 Boostedt (Germany) 121, 132
 border
 decorative 12, 247, 255, 261
 finishing 14, 34, 161–162, 164, 298–300, 373, 375–376
 fringed 208
 plaited 34, 36, 37, 356
 rep 47, 413
 starting 11, 13–14, 30–34, 36, 41, 54, 113, 128, 130–132, 134–135, 157, 165, 175, 236, 254, 258, 261, 288, 301, 354–356, 362–363, 371, 373–374, 376, 388, 439, 447
 tablet-woven 13, 39, 43, 47, 55, 57, 113, 149, 162, 175, 229, 244, 248–251, 254–263, 280, 282, 284, 287–288, 299, 300, 341, 383, 389, 438
 twined 161, 164, 175
 Bordesholm (Germany) 152, 157
 Bornholm Island (Denmark) 90, 92, 103, 111, 113
 Bornitz (Germany) 121, 132
 Borno (Italy) 202, 208
 Borremose (Denmark) 90, 103, 105, 107, 440
 Borum Eshøj (Denmark) 90, 97, 100–102
 Bosporan Kingdom 401
 braiding 1, 144, 171, 208, 269–271, 403
 Bramois (Switzerland) 366, 390, 392, 394–395
 Braunsbedra (Germany) 152, 156, 160
 Breaking flax 14
 Břeclav (Czech Republic) 305, 316, 319
 Breiheimen (Norway) 274, 275
 Breungenborn (Germany) 121, 131
 Briedel (Germany) 121, 136
 Brig-Glis (Switzerland) 366, 386
 Brilon (Germany) 152, 156, 176
 Brno (Czech Republic) 305, 316, 321–322, 326
 brocade 13, 17, 167–169, 254, 289, 410, 413, 416
 Broglio di Trebisacce (Italy) 214, 224
 Broighter (Ireland) 427, 430
 Bronze Age v, vii, 6–9, 13, 18–20, 25, 27–42, 48, 55–56, 59–60, 89, 91–93, 97–104, 109, 114–115, 119, 122–130, 132–135, 153, 182, 185–188, 192, 197, 201, 203–212, 215–216, 218–222, 224, 227, 228–229, 233, 237, 259, 264, 267, 273, 275–277, 279, 291, 293–297, 302, 304, 306–309, 212, 332, 334–339, 347, 349–356, 359, 361–363, 365, 368, 378–385, 395, 397, 400, 402–404, 415, 428–435, 440, 444–446, 449

- brown 20, 30, 37, 43, 46, 55, 104, 280–282, 285, 299, 353, 355, 361–362, 403, 405–406, 409–410, 412–413, 437
 Bučany (Slovakia) 305, 307, 315, 319
 Buch (Germany) 121, 128
 Bučovice (Czech Republic) 305, 316
 Burgweinting (Germany) 121, 127
 burial mound = *tumulus* 28, 91–92, 124, 139, 141, 194–195, 197, 276, 279, 293, 312, 314, 351, 353, 379, 384, 392, 400, 405, 409, 419, 448 (*also see* kurhan)
 Burton Fleming (England) 443, 447–449, 454
 Buskerud (Norway) 274, 279, 281
 button 231, 247, 266, 270, 282, 434
 hole 282
 Býčí Skála (Czech Republic) 305, 310
 Bylany (Czech Republic) 305, 310
 Byssus = sea-silk 8, 219

 cabling 9, 376
 Čáčov (Slovakia) 305, 322
 Cadiz (Spain) 333, 340–341, 343
 Cala San Vincenç (Spain) 333
 Cales (Italy) 214, 229, 233
 calfskin 94, 357
 camel hair 413–414, 166, 168, 175
 Camelon (Scotland) 427, 438
 Canosa (Italy) 214, 224, 227
 cap 97, 107, 114, 271, 420
 cape 105, 270–271, 339, 380
 hooded 428, 436, 438–439
 skin 105–109, 114, 133, 359, 390, 428, 431, 434–435, 436–437, 439–440
 Capena (Italy) 231, 161
 Capo Graziano culture 203
 Capua (Italy) 261
 carbonised
 textile 2, 4, 82, 135, 187, 189, 206, 215, 219, 298, 307, 310, 335, 338, 341, 378, 433, 446, 448
 wood 235–236
 Cardial culture 335, 338
 carding 8
 Carpathian Mountains 295, 308, 311, 321, 400, 420
 carpet 13, 301
 Carpow (Scotland) 427, 438
 Carrowbeg North (Ireland) 427, 436
 Casale di Rivalta (Italy) 214, 220
 Casale Marittimo (Italy) 214, 216, 220, 230, 232
 cashmere 167–168
 Caspian Sea 400
 Castaneda (Switzerland) 366, 390–395
 Castel di Decima (Italy) 2, 214, 230
 Castellaro del Vhò (Italy) 202, 204, 208–209
 Castelluccio culture 203
 Castione dei Marchesi (Italy) 202, 204, 209, 222, 228
 Castro culture 336–337
 Catacomb culture 400, 403–404
 cattle 400–402, 429, 431, 445
 hair 126, 134–135, 176, 432, 435
 skin 105, 431, 437
 Caucasus 8, 400
 caulking 110, 281
 cave 122, 126–127, 130, 133, 196, 310, 334
 Celtic culture 29, 125, 139, 142, 149, 154, 217, 297, 308, 384, 430, 437, 444
 Celts 124, 139, 145–146, 235, 308, 335
 Čeradice (Czech Republic) 305, 309
 Cerveteri (Italy) 214, 221
 Chabielice (Poland) 292, 297
 Chalcolithic – *see* Eneolithic period
 Chania (Greece) 183, 189–190
 Channel 445–446
 Chersonesos (Ukraine) 398, 401, 410, 414–416
 chiton 250
 Chiusi (Italy) 214, 223–224, 232
 Chortomlyk (Ukraine) 398, 405–406, 415
 Chorvátsky Grob (Slovakia) 305, 313
 Chotín (Slovakia) 305, 315, 319–320
 Chrzastów (Poland) 292, 295, 297
 Chýně (Czech Republic) 305, 317, 320
 Cifer-Pác (Slovakia) 305, 321, 323–327
 Cimmerian culture 400
 Civita Castellana (Italy) 214, 227, 261
 clasp, weaving 11, 236, 259–261
 Classical period 182, 187, 195, 199, 201
clavus 162, 173, 176, 251
 cloak 110, 113, 135, 222, 224, 227, 394, 447, 454
 female 419
 kidney-shaped 93, 97, 101–102, 351
 oval 353, 357, 359–361, 363
 rectangular 110, 160–165, 287–288, 299
 skin 428, 437–440
 Cloncowan (Ireland) 427, 431
 Coarhamore (Ireland) 427, 431
 coiling 207, 260, 381
 coinage 29, 79, 154, 308, 445, 452
 Colchester (England) 443, 448, 454
Collegium centonariorum 65, 74–75, 84
 Cologne (Germany) 152, 153, 155–156, 166–169, 171, 174, 176
 comb 11, 56, 75, 203, 208, 338, 362, 449, 453
 flax 6, 73
 iron 72–74, 166, 391–392, 395, 453
 weaving 18, 453
 wool 8, 73, 166, 169, 453
 combing wool 7, 51, 166, 343, 381
 Coppa Nevigata (Italy) 214, 224
 cord 13, 15, 17, 33, 40–41, 105, 115, 130, 148, 162, 170, 205, 207–209, 255, 257, 267–268, 270, 310, 318, 338, 341–342, 355, 361–363, 370–371, 403–404, 432, 435, 449
 cordage 1, 205–206, 233, 306
 Corded Ware culture 267, 293, 267, 278, 400
 Corfu Island (Greece) 183, 191, 193–197
 Cortaillod culture 378
 costume vii, 2, 4, 47, 91–94, 97–98, 102–104, 109–110, 113–115, 122, 160, 174, 188, 215, 229, 243, 272, 277–278, 286, 342, 352, 362, 382, 395, 402, 415, 418
 female 80, 99, 106, 113, 230, 342, 406, 410, 420
 male 65, 100, 161, 205, 282, 287–288, 420
 national 33, 419
 riding 162
 cotton 5–6, 10, 167–168, 175, 196, 198, 219, 406, 413, 420
 Craigie (Scotland) 427, 437
 crannog 429, 431, 437
 cremation vii, 28, 49, 78, 82, 92, 97, 103, 122–124, 132–133, 140, 154, 156, 158–159, 167, 173–174, 186, 194–195, 197, 216–217, 276–277, 293–295, 298, 312, 314, 319, 322, 335–336, 338, 341, 351–352, 357, 359, 379, 445
 Crete 20, 135, 183, 185–185
 Crimea = Crimean Peninsula (Ukraine) 295, 398, 400–401, 403, 405, 407–410, 414, 420
 Croatia 28
 Croce del Papa (Italy) 202, 204, 209
 Cromaghs (Ireland) 427, 433, 435
 Cucuteni-Tripillya culture 399, 417
 Cueva Sagrada (Spain) 333, 338
 Cuevas de la Garrobina (Spain) 333, 339
 Cuma (Italy) 214, 232
 curing 20, 106, 114
 cutting 34, 55, 60, 94, 97, 102, 104, 108, 113, 115, 161, 249, 258–357, 361, 437
 Cuxhaven (Germany) 152, 176
 Czech Republic 1, 28–29, 123–124, 262, 293, 304–331

 Dätgen (Germany) 151, 161
 damask 175
 block 13, 168, 173
 silk 173, 454
 Damendorf (Germany) 113, 127, 132–135, 151, 161
 Danube River 27, 29, 66–67, 75, 154, 293–294, 306, 308–309, 326, 378, 399–400, 452

- darning 4, 17
 dating
 dendrochronology 44, 135, 154, 294, 378–379, 381
 palynology 127, 134, 359
 radiocarbon 4, 94, 100, 105, 111, 113–114, 154–155, 160–162, 335, 356–357, 359, 379–381
 relative 185, 308, 379
 deerskin 105, 205, 431, 434, 436, 439
 Dehnsen (Germany) 121, 130
 Dejbjerg (Denmark) 90, 113
 Delley-Portalban (Switzerland) 366, 369–370
 Demetrias (Greece) 183, 195
 Denmark v–vii, 2, 89–118, 125–127, 155, 270, 276, 279, 284, 287, 302, 349, 351–352, 361–362, 429, 430, 440
 Derrybrien (Ireland) 428, 430
 Derrykeighan (Ireland) 428, 434–436, 439
 Deutschkreutz (Austria) 26, 81–82
 Devín (Slovakia) 305, 324
 Dienheim (Germany) 151, 168
 Dietzhausen (Germany) 121, 130
 Dillingen-Pachten (Germany) 151, 167, 172
 Diocletian's Price Edict 81–82, 455
 distaff 10–11, 54, 57, 68, 76, 78, 84–85, 168–169, 233, 235–236
 amber 10, 68, 168, 231
 bone 10, 68, 70, 72, 74–75, 78
 bronze 10, 54, 78, 231
 glass 10, 68, 70, 74
 ring 68, 70, 78, 85
 Ditzfurt (Germany) 121, 126, 128
 Dmitrenkiva Balka (Ukraine) 398, 407
 Dniro River 399–401, 407
 Dni prorudne (Ukraine) 398, 403
 Dniro River 399
 Dobeč (Czech Republic) 305, 314
 Döhren (Germany) 121, 133, 228
 Dölsach (Austria) 26, 84
 Dömmestorp (Sweden) 348, 353, 355–356
 Dösen (Norway) 374, 278, 286
 Doles Kivutkalns (Latvia) 265, 270
 Domaradz (Poland) 292, 296
 Domaław (Poland) 292, 296–297, 302
 Dragsholm (Denmark) 90, 94
 dress 73, 97, 102, 130, 160, 221, 230, 242, 353, 382, 407–408, 415, 418–420, 429–430, 436, 440, 452
 dressing distaff 236
 drop spindle 9, 11, 54, 327
 Dürrnberg (Austria) 26–27, 29, 30, 41–42, 44–47, 49, 54–56, 59, 60, 97, 125, 327
 Dún Aonghasa (Ireland) 427, 431
 Dun Cuir (Scotland) 427, 437
 Dun Telve (Scotland) 427, 431
 Dviete (Latvia) 265, 270
 dye 2, 4, 5, 17–20, 32, 38, 43, 45, 55, 57, 67, 104, 127, 130, 145, 149, 157, 223–224, 227
 analysis 29, 32, 43, 46, 94, 104, 110, 141, 144–145, 224
 mordant 43, 145, 224
 plant 46, 67, 104, 189, 224
 vat 43, 234
 dyeing 5–6, 8, 17–20, 32, 33, 38, 43, 46, 54–56, 71, 74–75, 79, 84, 94, 104, 127, 130, 134, 144, 160, 162, 168, 173, 224, 234, 236
 piece 33, 104, 247, 361
 East Baltic culture 266, 268
 Eberdingen-Hochdorf (Germany) vi, 20, 125, 133, 139–150, 262, 386, 389
 Egolzwil (Switzerland) 366, 367, 378
 Egolzwil culture 378
 Egtved (Denmark) 90, 93, 97, 99, 432
 Egypt 2, 9, 10, 70, 125, 185, 219–220, 234
 Elbe River 123, 154, 294
 El Cigarralejo (Spain) 262, 333, 334, 341–342
 Eleusis (Greece) 184, 198
 Elling (Denmark) 90, 103
 embroidery 4, 13, 17, 101, 129, 142, 147, 149, 157, 187, 195, 198, 206, 242, 316, 321, 322–323, 326, 381, 399, 407, 412, 416, 419–420, 447
 Eneolithic 201, 203–205, 210, 397, 399, 402, 404, 415
 England 5, 432–456
 Enns-Lorch (Austria) 26, 75
 epigraphy 65, 84, 169, 220, 221, 336, 452
 Eretria (Greece) 194, 232
 Ersigen (Switzerland) 366, 383–384, 387
 Ertebølle culture 94
 Eschenz (Switzerland) 366, 370
 esparto 5, 166, 167, 175, 341
 Estavayer-La Tenevière (Switzerland) 366, 370
 Este (Italy) 214, 223, 230
 ethnographic 6, 16, 350, 406
 parallels 114, 162, 309, 311–312, 370
 Etruscan culture 47, 215, 217–218, 220, 228–233, 242, 247–248, 251
 Etton Woodgate (England) 443, 446
 Euboea (Greece) 194, 232
 Eurasia 2, 403, 414
 Evebø (Norway) 274, 277–279, 286
 experimental archaeology 5, 6, 206, 373–375
 Faenza (Italy) 214, 226
 Faliscan culture 221
 Falkirk (Scotland) 427, 437
 fashion 65, 236, 278, 419, 446, 452, 454
 Feddersen Wierde (Germany) 121, 132, 135, 152, 155–157, 160, 163, 174–175
 Fellbach-Schmieden (Germany) 121, 129
 Felt 6, 10, 32, 127, 130, 133–134, 163, 287, 310, 341, 355, 405–406, 414, 416–418, 419
 Fivè Carera (Italy) 204, 206–208, 211
 fibre
 analysis 29, 271, 361
 animal 2, 3, 6, 9, 135, 143, 189, 206, 218–219, 270, 309, 381–382, 317
 diameter 6, 7, 103, 135, 271, 386–387, 392–394, 407
 identification 1, 188, 194, 196, 205, 402, 403
 plant 2–3, 5–6, 27, 82, 94, 96–97, 103–104, 110, 114–115, 126–127, 131–132, 135, 141–143, 147–148, 159–160, 166, 175, 188–189, 195, 205–206, 218, 228, 247, 249, 268, 270–272, 281, 310, 316–317, 319–320, 350, 355, 368, 378, 386, 388, 402–407, 409, 413, 416, 432–433, 438, 448–449
 fibula 3, 46, 82, 92, 102–103, 105, 113, 158, 160, 162–163, 218, 226, 228, 230, 232, 244, 249, 278, 307, 319, 320, 322–323, 325, 379, 388–390, 392, 394–395, 428, 430–431, 446
 Ficana (Italy) 259
 finishing 17, 34, 47, 55, 71, 73–75, 77, 79, 85, 161–163, 169, 236, 258, 299, 373, 376, 449
 Finland 349
 Finns 268
 Fiskerton (England) 443, 453
 flavone 20, 361
 flax
 cultivation 67, 77, 85, 163, 166, 211, 221–222, 276, 351–352, 416, 429, 453
 processing 51, 68, 166–167, 222, 234, 268, 284, 356, 381, 384, 416
 seed 97, 103, 205, 207, 220, 279, 356
 seed capsule 6, 104, 163, 205, 220
 stem 103, 110, 114
 flaxfield catchfly 220
 Flintbek (Germany) 121, 129–130, 133
 floating thread 41, 43, 46, 147, 280–381
 Flögelin-Voßbarg (Germany) 152, 160
 folding 105, 250, 433
 Fole Prästegård (Sweden) 348, 357–358
 foot wrap 97, 100
 Forcello di Bagnolo S. Vito (Italy) 214, 236
 Forggensee (Germany) 152, 169
 Fornace Grandi di Bondeno (Italy) 202, 211

- Forno del Gallo a Beneceto (Italy) 202, 211
Fossakultur 216
 Fræer (Denmark) 90, 110
 Francavilla Marittima (Italy) 214, 235
 France vii, 28, 123–125, 144–145, 197, 262, 194, 308, 343, 368, 378, 430
 Franzhausen (Austria) 26, 28, 30, 36, 37, 45–46, 49, 51, 55
 Frattesina (Italy) 214, 224
 Frauenberg (Austria) 26, 78, 82–83
 Freundorf (Austria) 26, 54, 59, 313
 Fring (England) 443, 448
 fringe 13, 17, 72, 105, 161, 187–188, 206, 208, 227, 255, 257–258, 261, 278–279, 284, 287, 299, 339, 373, 407, 438–439, 447
 Frög (Austria) 26, 54
 Frydenlund (Denmark) 90, 104
 Führholz (Austria) 26, 30, 42, 44–45
 fulling 17, 20, 33, 55, 71, 74, 75, 82, 84, 85, 97, 169, 236, 447
Fullonica 17, 71–72, 74, 77, 80, 85, 169
 funerary
 practice vii, 28, 103, 195, 197, 217, 229, 231–233, 235, 295, 322, 351, 400
 pyre 196, 242, 243, 247, 334, 337
 relief 66, 72, 78, 80, 82, 452
 Gailiši (Latvia) 265, 267, 269, 271
 Gallagh (Ireland) 427, 434, 436, 439
 Gallia
 belgica 154
 cisalpina 80
 garment
 ceremonial 229, 244, 249, 251–252
 female 103, 105
 gender-specific 97, 105
 male 103
 tubular 105, 113, 115, 361
 wrap-around 93, 97, 105, 114
 Garlstorf (Germany) 152, 158
 Gars-Thunau (Austria) 26, 41
 Garton Slack (England) 443, 446, 448
 Gelduba (Germany) 167
 Geneva (Switzerland) 366, 379
 Geometric period 182, 186, 194, 197
 Germania
 inferior 154
 libera 154–155, 157, 159, 160, 163, 168, 174–175
 superior 154
 Germanic 67, 70, 78, 153–155, 163, 174–176, 308–309, 322–323, 326, 352
 Germany vi–vii, 8, 19, 27–29, 55, 77, 91, 110, 119–181, 195, 229, 233, 262, 276, 280, 284, 287, 308, 362, 368, 379, 382, 386, 410, 420, 429
 Gerulata (Slovakia) 305, 308
 Gerum Cloak 353, 357, 359, 361, 363
 Gettorf (Germany) 152, 157
 Gevelinghausen (Germany) 121, 130
 Gießmannsdorf (Germany) 152, 160
 gift exchange 57, 149, 312, 429, 454
 Gilgenberg (Austria) 26, 42, 44–45, 49
 Giubiasco (Switzerland) 366, 379
 Gjeite (Norway) 274, 280, 288
 glass 9–10, 17, 46, 59, 68, 70, 72, 74, 78, 114, 167, 174, 229–230, 235, 248, 251–252, 277, 279, 286, 352, 362, 429, 431, 449
 Głównin (Poland) 292, 297
 Glyfada (Greece) 184, 196–197, 199
 Gnoien (Germany) 152, 160
 goat 105, 175, 187, 221–222, 356, 386, 390, 429, 431, 435, 437
 hair 6, 135, 176, 189, 219, 392, 414
 skin 205, 384
 Göritz (Germany) 152, 156
 Golasecca culture 216, 379
 gold thread 17, 31, 131, 157, 159, 167–169, 173–175, 196–197, 227, 237, 326, 334, 343, 399, 407–410, 413–416, 420, 448
 Gommern (Germany) 152, 157, 160
 gore
 tailoring 101, 109, 283, 286
 weft 34, 36, 357, 361
 Goths 295, 309, 397, 401
 Gotland (Sweden) 349, 352, 357–358
 Grabenstetten (Germany) 121, 127
 Gräfenhainichen (Germany) 121, 132
 graffiti 68, 74, 78–79
 Gran Carro (Italy) 214, 230, 235
 Grange Rath (Ireland) 427, 430
 grass 115, 126, 144, 218–219, 341, 404, 413, 420
 Grauballe Man 90, 103
 Gravendorf (Austria) 26
 Gravina di Puglia (Italy) 214, 236–237
 Great Britain 125, 163
 Greece vii, 9, 57, 182–200, 401, 418
 Greek
 colonies 217, 332, 401, 416
 colonisation 186
 culture 187, 341
 green 20, 30, 37, 43, 46, 55, 82, 167, 223, 271, 282–284, 286–287, 406
 Greifensee-Bösch (Switzerland) 366, 379, 381–382
 Gremersdorf-Teichelwitz (Germany) 152, 162
 Gricignano d'Aversa (Italy) 202, 204, 207, 210, 219
 grinder 20
 Gródek (Poland) 292, 298
 Gronowo (Poland) 292, 297–299
 Grossmugl (Austria) 26
 Grossweikersdorf (Austria) 26
 Grotta di Santa Croce (Italy) 202, 205
 ground weave 12, 34, 43, 101, 146, 162–163, 207, 247–251, 255, 258–259, 280, 284–285, 371, 376, 388
 Grünau (Austria) 26
 Grundfeld (Germany) 121, 129–130, 133
 Grzybnica (Poland) 292, 298
 Guadalquivir River 336
 Guadiana River 336
 Gudendorf (Germany) 152, 156
 Gudo (Switzerland) 366, 389, 445–446
 Guernsey (UK) 445–446
 Guldhøj (Denmark) 90, 93, 97, 100–101
 Gundestrup (Denmark) 90, 92, 434, 436
 Gussage-All-Saints (England) 443, 449
Gynaecaeum 169
 gypsum 2, 154
 Haaland (Norway) 274,
 Haastrup (Denmark) 90, 97
 Hadrian 451
 Hadrian's Wall 163, 453
 Hagenow (Germany) 152, 158–159
 Haimanova Mohyla (Ukraine) 398, 414, 418
 hair moss 454
 hairnet 18, 97, 167, 206, 432
 half-basket weave 12, 43, 83–84, 161–162, 171, 175–176, 296, 307, 315–316, 319, 339, 373, 438, 454
 Hallem (Norway) 274, 279, 280–281
 Hallstatt
 culture 28, 40, 42, 47, 55, 59, 123–124, 134, 139, 294, 296, 307–308
 period 16, 28–29, 38, 42–44, 50–51, 54–60, 119, 122–124, 127, 131, 135, 139–140, 293–297, 302, 304, 306, 308, 310–314, 318, 327, 379, 382–389
 site (Austria) 28–32, 34, 37–49, 55–56, 125
 Halsnøy (Norway) 274, 278, 281
 Haltern (Germany) 152, 171
 Hamm-Westhafen (Germany) 152, 156
 Haraldskær (Denmark) 90, 93, 103
 Harrislee (Germany) 121, 129–130, 135
 Haßleben (Germany) 152, 160
 hat 102, 139, 205
 pointed 418–419
 Haughey's Fort (Ireland) 427, 429, 431–433
 Hauterive-Champréveyres (Switzerland) 366, 382
 headdress 30, 419, 420, 430, 439, 440
 heddle 1, 14–15, 55, 76, 371–373, 376, 416
 bar 15
 rigid 73, 75

- heddlings 371
 Hedegård (Denmark) 90, 103
 Hedmark (Norway) 274, 279
 Heidenau (Germany) 121, 132, 136
 Heiligenhafen (Germany) 152, 176
 Helgeland (Norway) 274–275, 277–279, 285, 287, 289
 Hellbrunner Berg (Austria) 26, 55, 60
 Hellenistic period 182, 187, 195–196, 199, 201, 226–227, 235, 237, 415
 helmet 171–172, 207, 341, 438
 Helpringham (England) 442, 448
 Helzendorf (Germany) 152, 149, 158
 hem 17, 36, 83, 287, 407–408
 Hemmaberg (Austria) 26, 78
 Hemmoor (Germany) 152, 155, 158, 176
 hemp 3, 5, 32, 45, 126–127, 141–144, 147, 167, 175, 198, 207, 210–211, 219, 223, 268, 279, 314–316, 319, 326, 336, 338, 341–342, 344, 386, 388, 402–403, 406–407, 413, 416, 432, 435, 445, 448 seeds 314
 Herodotos 400, 401, 413, 419
 Herzprung (Germany) 152, 156
 Heuneburg (Germany) 139
 Heyevy Mohyly (Ukraine) 398, 405
 Himera (Italy) 214, 219, 236
 Himlingøje (Denmark) 90, 92
 Hispania
 baetica 337
 tarraconensis 337
 Hjortspring (Denmark) 90, 105, 109, 127
 Hlyns'ke Horodyshche (Ukraine) 398, 407
 hoard 71–72, 75, 79, 82, 162, 267, 196, 209, 233, 269–270, 429–430, 432–433, 437, 448–449
 Högom (Sweden) 348, 353
 Hoje Taastrup (Denmark) 90, 102
 Höresham (Germany) 121, 131
 Hohmichele (Germany) 8, 55, 121–122, 124, 127, 131, 141–142, 146–147, 229
 Holborough (England) 443, 454
 Holland 287
 Holodnyi Yar (Ukraine) 398, 407
 Holubice (Czech Republic) 305, 316, 318–320
 Homeric ritual 217, 197, 231–232
 Hoppstädten (Germany) 121, 131
 Horgen-Scheller (Switzerland) 367, 378
 Horgen culture 367, 378
 Hornbek (Germany) 152, 157–158
 Hornstaad (Germany) 121, 126
horodyshche 401
 Horodyshche (Ukraine) 398, 406
 horse 28, 84, 400, 410, 419, 429–430, 432, 439
 hair 6, 42, 171, 435
 household production 56, 59–60, 71, 84, 276, 293
 Hryshkove (Ukraine) 398, 405, 420
 Hügelsheim (Germany) 121, 131
 Huldremose (Denmark) v, 90, 93, 103–106, 108–109, 113, 160, 278, 287, 437
 Hungary 14, 28, 29, 50, 54, 262, 308
 Huns 67, 309, 397
 Hunsrück-Eifel culture (HEK) 124, 131
 Huntcliffe (England) 443, 454
 Hunteburg (Germany) 152, 161
 Hurbanovo-Abadomb (Slovakia) 305, 319
 Hurbanovo-Bacherov Majer (Slovakia) 305, 321
 Hustopeče (Czech Republic) 305, 319, 320
 Iapygian culture 216
 Iberian
 culture 336, 341
 Peninsula 308, 334–336, 341, 343–344, 433, 439
 Iceman 2, 205, 218, 219, 380
 iconography v, vi, 14, 47, 54, 82, 122, 125, 155, 168, 185, 211, 215, 228, 230, 236, 242, 251, 342, 402, 406, 418–419
 Igel Monument 82, 169, 170
 Illerup Ådal (Denmark) 90, 93, 110, 362
 Illyrian culture 296
 Immenbeck (Germany) 152, 176
 import 20, 28, 42, 46, 56, 57, 59, 71, 75, 85, 92, 124, 130, 139, 142, 145, 153–155, 167–169, 187, 217, 219, 221, 276–282, 286–288, 294, 297, 301–302, 323, 392, 406, 414, 432–433, 439, 448, 454
 impression
 cord 267, 306
 fibre 449
 textile 30, 159, 172, 266, 269–271, 275, 295–296, 306, 307, 320, 322, 436, 448
 indigo 18–19, 104
 indigotin 18, 32, 43, 104, 143, 145, 224, 250, 279, 281, 284, 409, 415
 indirubin 43, 104
 Ingoldmells (England) 443, 448
 inhumation 2, 27, 28, 82, 92, 122–124, 133, 140, 154, 156, 159–160, 173, 175, 186, 194–197, 217, 276–277, 288, 293–295, 297–298, 308, 314, 319–321, 335, 351–352, 358, 359, 379, 384–385, 390, 392, 395, 400, 447–448
 inscription 65, 73–74, 78, 80, 84–85, 154, 167–168, 220, 226, 276, 337, 379
 Ireland vi, vii, 426–442, 445, 446
 Irgenhausen (Switzerland) 366, 381, 395
 Iron Age v–vii, 6, 16, 19, 25, 27–30, 32, 38–45, 47–51, 53–55, 57, 59–60, 65, 67, 84, 89–94, 97, 102–105, 109–115, 119, 122–130, 132–135, 139, 144, 149, 153–157, 161–163, 175–176, 186, 194, 197, 201, 204, 212, 215–216, 218–224, 227–229, 232, 234–235, 237, 242, 251, 259, 262, 264, 267, 271–273, 275–281, 284–285, 287–289, 293–295, 297, 302, 306, 309, 313, 326–327, 332, 335–336, 341, 347, 349–353, 357, 359, 361–363, 378–380, 383, 385–387, 395–396, 400, 405, 416, 420, 428–432, 436–440, 444–445, 447–449, 451–455
 Irsch (Germany) 121, 131
 Irun (Spain) 334, 343, 344
 Islay Island (Scotland) 427, 428
 Isolino di Varese (Italy) 214, 220
 Issendorf (Germany) 152, 176
 Italy vi–vii, 2, 11, 14–15, 17, 28–29, 47, 50, 54, 65–66, 68, 71, 78–81, 85, 162, 169, 186, 201–263, 313, 337, 368, 379, 380, 382
 Itford Hill (England) 427, 430
 Ivanka pri Dunaji (Slovakia) 305, 313
 ivory 70, 78, 168
 Jæren (Norway) 274, 277, 279, 281, 284
 Janíky (Slovakia) 305, 313
 Jankowice (Poland) 292, 296
 Jartypory (Poland) 292, 298
 Jastorf culture 124, 132, 133, 153
 Jenišův Újezd (Czech Republic) 305, 318
 jewellery 28, 30, 113, 123, 133, 139, 144, 149, 158, 168, 244, 278, 281, 320, 339, 351, 440, 447
 Jühdenerfeld (Germany) 121, 134
 Jülich (Germany) 152, 167
 Julius Caesar 153, 451
 Kalenderberg
 culture 42
 site (Austria) 26, 42, 45, 308, 312–313
 Kalkriese (Germany) 152, 154, 163, 165–166
 Kalsdorf (Austria) 26, 75, 79–80
 Kalyvia (Greece) 184, 193, 195, 198
 Kamatero (Greece) 184, 193, 195, 198
 Kamenín (Slovakia) 305, 315
 Kam'yana Mohyla (Ukraine) 398, 420
 Kam'yans'ke Horodyshche (Ukraine) 398, 407
 Karagodeuashkh (Russia) 398, 419
 Karavan (Ukraine) 398, 405, 414, 416, 418
 Karmøy (Norway) 274, 277, 279
 Kasseedorf (Germany) 152, 156
 Kayhausen (Germany) 121, 134
 Kazenna Mohyla (Ukraine) 398, 420
 Kebister (Scotland) 427, 431

- Kemathen (Germany) 121, 129
 Kemmathen (Germany) 121, 127, 133
 Kemnitz (Germany) 152, 156, 159
 kemp 2, 6, 126, 134, 361
 Kempten (Germany) 152, 169
 Kerameikos (Greece) 8, 184, 195, 197–198
 Kerch (Ukraine) 398, 401, 409, 411, 412, 413, 414, 415, 416
 kermes 19, 46, 57, 145, 414, 420
 kermesic acid 46, 145
 Ketzendorf (Germany) 152, 160
 Kiebitz Moor (Germany) 121, 132, 135
 Kiev (Ukraine) 398, 411, 416, 420
 Kilen-Balka (Ukraine) 398, 409
 Killymoon (Ireland) 427, 429–430, 433
 Kirkburn (England) 443, 447
 Kleinhadersdorf (Austria) 26, 41
 Kleinklein (Austria) 26, 50, 54, 58–59, 311–313
 Kleinlangheim (Germany) 152, 159–160
 Kloten-Hoberg (Switzerland) 366, 384
 Klučov (Czech Republic) 305, 326
 Knockaulin (Ireland) 427, 431
 Knocknalappa (Ireland) 427, 431
 Knossos (Greece) 187, 373
 knot 101–102, 187, 342, 373
 carpet 301, 454
 cow-hitch 342
 half-hitch 373, 376
 knotless netting 12, 446
 knotted
 cord 270
 fringes 13
 netting 1, 270
 pile carpet 301
 knotting 10, 13
 Knyshivs'ke Horodyshe (Ukraine) 398, 407
 Körchow (Germany) 152, 156, 158
 Kolisnykivka (Ukraine) 398, 403
 Komořany (Czech Republic) 305, 322
 Konz-Filzen (Germany) 121, 131
 Koropi (Greece) 184, 193, 195, 198
 Kostolná pri Dunaji (Slovakia) 305, 322
 Kowalewko (Poland) 292, 298
 Krakovany-Stráže (Slovakia) 305, 309, 322
 Krefeld-Gellep (Germany) 152, 167, 168, 173
 Křenovice (Czech Republic) 305, 319
 Křepice (Czech Republic) 305, 326
 Křinec (Czech Republic) 305, 314
 Kronshagen (Germany) 152, 157
 Krosshaug (Norway) 274, 278
 Kul'-Oba (Ukraine) 398, 418, 419
 kurhan 401, 403, 405–408, 413–415
 Kvalsund (Norway) 279
 Kvassheim (Norway) 274, 279, 281, 284, 288
 Kyjovice (Czech Republic) 305, 309
 La Albufereta (Spain) 333, 334, 342
 La Marmotta (Italy) 202, 204–205, 220
 La Piana (Italy) 214, 235, 339
 La Salud (Spain) 333, 337
 La Tène
 culture 28–29, 119, 124, 131, 294, 379, 430, 437
 period 25, 28–29, 42, 44–47, 49, 51, 54–57, 59–60, 70, 120, 125, 127, 129, 132, 149, 269–270, 291, 297, 304, 306–309, 314–322, 327, 365, 379, 383, 386–395, 444, 446–447
 Łabędy-Przysówka (Poland) 292, 296
 lac 19
 Ladenburg (Germany) 152, 169
 Lagozza culture 211, 383
 Lagozza di Besnate (Italy) 202, 204, 205, 210–211, 212, 214, 220
 lake dwelling 6, 220, 367, 368, 278–381, 395
 landscape 91–92, 267, 359–351, 444
 Langenthal-Unterhard (Switzerland) 366, 384, 389
 Las Angorrillas (Spain) 333, 340, 341
 Las Ermitas (Spain) 333, 344
 Lasowice Małe (Poland) 292, 296
 Latdorf (Germany) 121, 126, 128
 Late Antique period 67, 78, 82–83, 155, 167–168, 173
 Lattrigen (Switzerland) 366, 370
 Latvia vii, 264–272
 Lazise (Italy) 214, 220
 leather 2, 11, 17, 27, 44, 47, 49, 82–84, 91, 97, 100, 109, 115, 142, 160, 169, 218, 259
 Lefkandi (Greece) 183, 190–192, 194, 197
 leg wrapper 47, 105, 111, 113, 161, 163
 legging 47, 205, 212, 223–224, 229
 Leith Hill (Scotland) 427, 438
 Lešno (Poland) 292, 296, 298–301
 Letky (Czech Republic) 305, 317
 leveller 18
 Levice (Slovakia) 305, 326
 Lexden (England) 443, 448, 454
 lichen dye 20, 104
 lime/linden bast 5, 94, 219, 336, 338, 368, 449
 Limes Romanus 66, 75, 154, 302, 308–309, 352
 Lindebjerg (Denmark) 90, 95
 Lindow Moss (England) 427, 432
 Linear B 186
 Linear Pottery culture 378
 linen 10, 17, 28, 30–31, 37–38, 42, 44–46, 55–56, 79, 82–84, 104, 114, 126–127, 130–131, 133, 141, 149, 157–160, 163, 166–168, 173–175, 188–192, 194–195, 197–199, 206–208, 211, 215, 219–222, 228, 231, 233–234, 271, 279, 288, 297–299, 310, 315, 319–322, 326–327, 334, 337–339, 241, 343–345, 360, 362, 369, 380–382, 384–386, 395, 406, 412–413, 429, 432–434, 436, 440, 446
 book 219–220, 234
 lining
 armour/helmet 171, 230, 341
 belt 49, 52
 garment 249, 409
 scabbard 49, 133
 shoe 110, 114
 linseed – *see* flax seed
 Linz-St. Peter (Austria) 26, 54–55, 57, 60
 Liptovská Mara (Slovakia) 305, 326
 Lisnacrogher (Ireland) 427, 430
 literary/written sources v, 29, 65–67, 75, 78–82, 84, 122, 125, 154–155, 167–179, 185–186, 221, 224, 237, 308, 335, 368
 Lithuania 278, 270
 Locarno (Switzerland) 366, 389
 Lochenice (Czech Republic) 305, 317
 Łódź (Poland) 292, 296
 Lønne Hede (Denmark) 90, 110
 Lommersum-Bodenheim (Germany) 152, 168
 Longobards 309
 Longola di Poggiomarino (Italy) 214, 235, 259
 loom 4, 13–16, 55, 57, 59, 104, 113, 115, 125, 128, 168, 175, 188, 206, 228, 232, 234, 251, 258, 263, 267, 287, 302, 363, 376, 402, 430, 449
 back-strap 14
 band 54, 416
 horizontal 16, 18, 54, 167–168, 363, 371
 tablet 254–255, 258–259, 262
 tension 371
 vertical two-beam 16, 68, 105, 128, 163, 168, 326, 350, 449, 453
 warp-weighted 11, 14–16, 41, 54, 59, 68, 93, 95, 102, 105, 113–114, 124, 128, 134, 156–157, 163, 168, 175, 210–211, 235–236, 254, 258, 260, 278, 284, 295, 297, 301, 311–314, 325–327, 363, 370, 380, 383, 385, 416, 447, 449, 453
 wide 301, 313
 with tubular warp 34, 163, 301, 363
 loom weight 14–16, 41–42, 51, 54, 71–78, 84–85, 95, 102, 105, 128, 133, 156, 168, 170, 203, 206, 208–209, 211, 235–236, 267, 295, 287, 301, 309, 311–314, 318, 321, 323–327, 335, 337, 350, 352, 369–370, 372, 416, 430, 449, 453
 conical 168, 301, 326, 340, 383

- cylindrical 313
 discoid 54, 301
 heart-shaped 339
in situ 16, 58, 70, 212, 232, 235–236, 307, 311, 313, 323–327
 lead 156, 168, 176
 pyramidal 54, 168, 311–312, 325, 453
 rheniform 211
 ring-shaped 383
 spherical 54, 340, 383
 stone 54, 386
 unfired 312, 325, 370
 looping 10, 12, 402, 415
 Los Millares
 culture 334–335, 338
 site (Spain) 333, 335–336
 Lough Gur (Ireland) 427, 431
 Loughnashade (Ireland) 427, 429–430
 Lubowidz (Poland) 292, 298
 Lucone di Polpenazze (Italy) 202, 204–205, 207–208
 Lusatian/Lausitz culture 123, 294, 312
 Lushøj (Denmark) 90, 96–97
 Lusitanians 336
 luteolin 32, 43, 104, 361
 Luttum (Germany) 121, 133
 luxury
 goods 28, 92, 153–154, 217, 309, 326
 material 9–10, 235, 416
 textile 141, 149

 Maciejowice (Poland) 292, 296
 madder 18–19, 33, 40, 46, 160, 224, 279, 282, 284–285, 287, 405, 407, 409, 414
 Magdalensberg (Austria) 26, 29, 65–65, 68–72, 74, 78–82, 84–85
 Mahndorf (Germany) 152, 160, 176
 Mainz (Germany) 152, 153, 155, 163, 167–169, 171, 173–174, 176, 302
 Mairena del Alcor (Spain) 333, 341
 Majkop culture 414
 Małkolic (Poland) 292, 296
 Malá nad Hronom (Slovakia) 305, 315
 Malé Kosihy (Slovakia) 305, 315, 320
 Mannersdorf (Austria) 26, 30, 42, 45–47, 51, 54–55, 57, 60–61, 322
 Mantern (Austria) 26
 mantle 17, 47–49, 79–82, 85, 97, 113, 219, 280, 282, 300, 323, 390, 437, 439
 semicircular 223–224, 229, 243–251, 255–159, 161–163
 Marathon (Greece) 184, 198
 Maria Saal (Austria) = Virunum 26, 71–72
 Marin-Epagnier (Switzerland) 366
 Maroussi (Greece) 184, 193, 195, 198
 Marsala (Italy) 214, 224, 226, 234
 Marx-Etzel (Germany) 152, 161, 175
 Marx-Stapelstein (Germany) 152, 161, 175

 Maślomęcz (Poland) 292, 298
 mass production 59–60
 Massalia (France) 335
 mat 310, 407
 Matran (Switzerland) 366, 383–385, 387
 Mattsee (Austria) 26, 30, 42, 44–45
 mattress 141–142, 144, 149
 Mautern (Austria) 26, 54, 57, 75–76
 Mazkatuži (Latvia) 265, 271
 Meberg (Norway) 274, 279
 Medieval period v, 2, 29, 295, 302, 311, 382, 390, 440
 Mediterranean
 influence 57, 66, 142, 454
 region vii, 14, 19–20, 28, 46, 59, 124, 139, 145, 149, 167–169, 186, 215, 217, 219, 232, 293, 335, 337, 343, 379, 454
 Sea 14, 309
 Mehrum (Germany) 152, 173
 Meilen (Switzerland) 366, 370
 Meilen im Grund (Switzerland) 366, 370
 Meilen Schellen (Switzerland) 366, 379
 Melderiški (Latvia) 265, 271
 Melhøj (Denmark) 90, 93, 130
 Melitopol's'kyi Kurhan (Ukraine) 398, 420
 mending 4, 17, 43, 79, 101, 229, 437
 Merenda (Greece) 184, 198
 Mesolithic period 89, 91, 94, 367
 Mesopotamia 185
 Mevaniola (Italy) 214, 226
 Michelstetten (Austria) 26, 54, 58
 microscopy
 Middle Dniπρο culture 400
 Migration period 29, 67–70, 78, 89, 120, 125, 154, 167, 273, 276–279, 281–288, 291, 295, 301–302, 304, 306–309, 326–327, 347, 353, 362
 Miletos (Turkey) 222, 401
 Milow (Germany) 152, 159
 Milton Lock (Scotland) 427, 431
 mineralisation 2–4, 20, 42, 65, 67, 93, 110, 140, 174, 185, 193–195, 204–205, 210, 219, 230, 232–233, 269, 275, 288, 296–297, 306–307, 309–310, 315–319, 321, 323, 326–327, 334, 340–341, 344, 360, 380–382, 384, 386–387, 392–395, 406, 436, 446–448
 mining
 copper 30
 iron 139
 salt 28–29, 31, 41–42, 56, 59
 silver 335–337
 Minoan
 culture 185–186
 period 189
 Miroslav (Czech Republic) 305, 316, 321
Mischwolle 386

 Mistrín (Czech Republic) 305, 316
 Mitterkirchen (Austria) 26, 28, 30, 42, 44–45
 Modlnica (Poland) 292, 295
 Møgelose (Denmark) 90, 112, 114
 Moesia 402
 Molina di Ledro (Italy) 61, 149, 202, 204–207, 211, 218–220, 222, 382
 moment of inertia 10
 Montelius chronological system 92, 24, 293
 Monte Bibele (Italy) 214, 220, 223
 Monte Circeo (Italy) 214, 224
 Montemerano (Italy) 202, 209–210, 233
 Montereale Valcellina (Italy) 214, 220
 Monte Sannace (Italy) 214, 236
 mordant 4, 18, 43, 145, 224, 405, 409, 414
 Moschato (Greece) 184, 198–199
 Motronyns'ke Horodyshe (Ukraine) 398, 416–417, 419
 Moynagh Lough (Ireland) 427, 431
 Mozia (Italy) 214, 224, 226, 236
 Mühlbach-Hochkönig (Austria) 26, 30–31
 Mühlberg (Germany) 152, 156
 Mühlen-Eichsen (Germany) 121, 126
 Mühlthal (Germany) 121, 127–129
 Münsingen (Switzerland) 366, 390–392, 395
 Muldbjerg (Denmark) 90, 93, 97, 101
 Munigua (Spain) 333, 334, 343
 murex 19, 226 (*also see* purple)
 Muri-Mettlen (Switzerland) 366, 394–395
 Murten-Löwenberg (Switzerland) 366, 385
 Mušov (Czech Republic) 305, 316, 321, 323
 Mužla-Čenkov (Slovakia) 305, 309
 Mycenae (Greece) 183, 186, 189, 192
 Mycenaean culture 186, 225

 napping 6, 8, 17, 79, 157, 169, 280, 412, 454
 Naquane (Italy) 14, 202, 211
 Narce (Italy) 261
 Narva culture 267
 Navan Fort (Ireland) 427, 429, 431, 436
 Nazzano (Italy) 261
 Near East 9, 125, 167, 187, 217, 406
 Nebel (Germany) 121, 130
 needle
 binding 94–95
 bone 16–17, 102, 156, 236, 449
 bronze 17, 55, 71–72, 76, 102, 114, 129, 156, 236, 325, 417
 case 76, 277
 hole 5, 195

- iron 17, 55, 71–72, 76, 114, 156, 417, 431
 plaiting 10
 sewing 17, 42, 55, 66, 71–72, 74, 76, 84, 102, 114, 129, 156, 169, 229, 236, 267, 277, 325, 417, 431, 449
 work 129, 130, 133–134
 Neolithic period 5–6, 9–10, 37, 55, 89, 91, 94–95, 123, 125–129, 134, 147, 201, 203–205, 207, 210–211, 215, 218–220, 228, 264, 266–270, 272, 276, 290, 293, 304, 311, 332, 334–335, 338, 347, 350, 356, 365, 367–382, 395, 413, 416, 430
 Neos Kosmos (Greece) 184, 199
 nets 436, 449
 fishing 9, 270, 334, 338, 342, 344
 netting 403
 knotless 12, 446
 knotted 1, 342
 nettle 3, 5, 20, 97, 104, 110, 114–115, 135, 189, 279, 350, 429, 431–432, 435, 445
 Neubrandenburg (Germany) 152, 158–159
 Neudorf-Bornstein (Germany) 152, 156–157, 159
 Neu Pansow (Germany) 152, 156
 Neupotz (Germany) 152, 172
 Neuss (Germany) 152, 172
 Neu Versen (Germany) 176
 Newstead (Scotland) 427, 438
 Newton-on-Trent (England) 443, 453
 Nieblum (Germany) 121, 133
 Nienburg (Germany) 121, 152, 156
 Nitra-Malý Seminár (Slovakia) 305, 314
 Nížkovice (Czech Republic) 305, 316, 321
 Nogaichik (Ukraine) 398, 408, 414
 nomadic culture 293, 308, 400–401, 416, 420
 Norddorf (Germany) 152, 157–158
 Noricum 29, 65–68, 70, 73, 75, 77–78, 80–82, 84, 154
 Norway vi, 91, 103, 128, 273–290, 349
Notitia dignitatum 169
 Nová Ves u Kralup (Czech Republic) 305, 317
 Nové Košariská (Slovakia) 50, 305, 311–314, 318
 Nové Zámky (Slovakia) 149, 305, 315, 321–322
 Novoplatonivka (Ukraine) 398, 403
 Novyi Merchyk (Ukraine) 398, 403
 Nowa Huta-Mogiła (Poland) 292, 298
 Nowy Łowicz (Poland) 292, 298, 300
 Nuragic culture 403
 Nydam (Denmark) 90, 93, 110
 Nydie Mains (Scotland) 427, 432
 Nymburk (Czech Republic) 305, 317
 Nymphaion (Ukraine) 398, 405
 oak 20, 209, 338, 368
 bast 5, 167
 coffin vii, 92–93, 97–98, 350–351, 354–355
 Oakbank (Scotland) 427, 437
 Obenaltendorf (Germany) 113, 152, 155, 157, 161–162, 164, 175
 Oberdrauburg (Austria) 26, 81–82
 Obora u Hořic (Czech Republic) 305, 317
 Odernheim (Germany) 121, 131
 Oder River 70, 293–294
 Odry (Poland) 292, 299–301
 Öland Island (Sweden) 349, 352, 362
 Oenotrian culture 216
 Ørbækgaard (Denmark) 90, 101
 Öremölla (Sweden) 348, 358–360, 362–363
 Östre Gerum (Sweden) 348, 357–361
 Øvre Berge (Norway) 274, 278–279, 282–283
 Okhrymivka (Ukraine) 398, 403
 Okoř (Czech Republic) 305, 317
 Oksenberg (Denmark) 90, 114
 Olbia (Ukraine) 398, 401, 410, 414, 416
 Old Scatness (Scotland) 427, 431
 Olmo di Nogara (Italy) 202, 204, 209
 Oppido Lucano (Italy) 214, 236
Oppidum 29, 449, 454
 Orientalising period 187, 201, 217, 237, 335
 Orkney
 Hood 438–440
 Islands 163, 430, 432, 439
 Orton Meadows (England) 443, 446
 Osimo (Italy) 214, 222
 Oslo (Norway) 274, 278
 Osowa (Poland) 292, 298
 Osterholz (Germany) 152, 158
 Osteria dell'Osa (Italy) 214, 227, 230–231
 Ostia (Italy) 169
 Ostrovany (Slovakia) 305, 309, 326
 otter skin 105, 434, 436
 Ożarów Mazowiecki (Poland) 292, 301, 326
 Padova (Italy) 214, 229
 Paestum (Italy) 214, 237
 Palaeolithic period 1, 91, 367, 399
 Palárikovo (Slovakia) 305, 314, 315, 321
 Palmyra (Syria) 301, 214, 220
 Palse (Italy) 214, 220
 Palù di Livenza (Italy) 202, 211, 214, 220
 Pannonia 29, 66, 67, 75, 76, 78, 82, 84, 155, 308, 309, 401
 Parma (Italy) 209, 214, 226
 pastoralism 293, 400, 401, 416
 patch 4, 17, 43, 109, 223, 229
 pattern
 checked 43, 46, 49, 73, 104, 133, 163, 221, 280, 282, 287, 299, 447
 dogtooth 43, 145, 149, 281, 288, 357, 361
 geometric 232, 282–283, 285–286, 312, 405, 410, 412–413
 lozenge 144, 206, 382, 409
 meander 43, 55, 142, 144, 171, 236
 ribbed 30, 34, 36, 37, 309, 371, 373, 434
 striped 30, 37, 41, 43, 45–46, 54, 55, 59, 84, 104, 113, 127, 146–147, 157, 159, 161–163, 168, 173, 247, 249–251, 255–257, (260), 261, 263, 280–283, 287, 380, 388, 402, 406, 411–416, 454
 weaving 220, 278, 287
 zoomorphic 287, 311
 Pazyryk (Russia) 414
 Pečky (Czech Republic) 305, 321, 322
 peat bog vii, 2, 91–92, 94, 103–105, 275, 360, 361, 367
 Pellingen (Germany) 121, 131
 peplos 105
 Pereshchepyne (Ukraine) 398, 405, 416
 Persia 415
 Pestenacker (Germany) 121, 129
 Petronell (Austria) 26, 76
 Pfäffikon-Burg (Switzerland) 366, 370
 Pfyn-Breitenloo (Switzerland) 366, 370, 372, 378
 Pfyn culture 367, 378, 380
 Phoenician/Punic
 colony 332, 335, 336
 culture/period 20, 216, 334–335, 340–341
 Piacenza (Italy) 213, 226
 Pianezzo (Switzerland) 366
 Picene culture 216
 piece-dyeing 33, 104, 247, 361
 Pielgrzymowo (Poland) 292, 298, 301, 302
 pigment 17, 224, 386
 pigmentation 4, 46, 97, 104, 168, 189, 271, 388, 447
 pile 13, 97, 101, 102, 301, 433, 454
 pile dwelling 149, 204, 205, 209, 211, 323, 368, 379, 380
 pillow 142, 144
 pin-beater 169, 453
 pine 20, 207, 270, 368, 439
 Pisa San Rosore (Italy) 214, 233
 Pisky (Ukraine) 398, 420
 Pisky Rad'kivs'ki (Ukraine) 398, 403
 PISOCHIN (Ukraine) 398, 406
 Pithekoussai (Italy) 214, 236
 pit house 114, 156, 168, 312, 323, 325, 352

- Piwonice (Poland) 292, 301
 plaiting 10, 13, 127, 134, 272, 356
 pleating 4, 17, 236, 250, 252
 Pliny the Elder 6, 220–222, 227, 251
 plucking 7, 453
 plying 10, 51, 384
 Po Valley 203–204, 216, 220–222
 Poggio Bacherina (Italy) 214, 236
 Pohľody (Czech Republic) 305, 314
 pollen 359, 378, 429
 Polada culture 203, 204, 208, 211
 Poland 70, 123, 125, 135, 156, 287, 291–302, 326, 327
 Polish cochineal 281, 287
 Pomeranian culture 294
 Pompeii (Italy) 169, 259
 Pontecagnano (Italy) 214, 232
 Poprad-Matejovce (Slovakia) 305–307, 326–327
 Populonia (Italy) 214, 221
 Porz-Lind (Germany) 121, 129
 Poštela (Slovenia) 311, 313
 Postoupky (Czech Republic) 316, 319
 Pottenbrunn (Austria) 26, 30, 42, 45–46, 51, 55
 Pozzuoli (Italy) 214, 224
 Pozzuolo del Friuli (Italy) 214, 235
Prachtmantel 299, 300, 454
 Praha (Czech Republic) 305, 313, 317, 326
 Pratola Serra (Italy) 214, 220
 Pre-Lusatian culture 293
 Přemyslení (Czech Republic) 305, 320
 preservation vi–vii, 2–4, 26, 42, 89, 91–92, 97, 134, 136, 140–141, 145, 153, 160, 166, 175, 187, 194–195, 197, 207, 209, 211, 215, 243, 275–277, 323, 326, 334, 339, 341, 344, 378, 380–381, 386–387, 394, 446–447
 Pretzsch (Germany) 152, 160
 princely burial 123, 134, 139–141, 143–144, 149, 157, 159, 233, 262
 Pritzler (Germany) 152, 158
 production organisation
 household 41, 56, 59, 60, 71, 84, 115, 237, 276, 444, 449
 household industry 56, 60
 specialised 57, 59, 235, 252, 276, 277, 278?, 311, 370, 445
 workshop 27, 29, 41, 59–60, 71–73, 75, 77, 79, 114, 169, 195, 236–237, 321, 323, 325–327, 352, 444
 Protoapennine culture
 Protovillanovan culture 216
 provenance 4, 103, 105, 159, 175, 249, 361
 Prüfening (Germany) 152, 166
 Przeworsk culture 294–295, 298, 301
 pseudomorph 2, 210, 225, 233
 Punic culture 341
 Purberry Shot (England) 443, 448
 purple dye 5, 18–20, 79, 104, 113, 145, 168, 173, 191, 195–197, 223–224, 226–227, 234, 237, 247, 251, 255, 407–409, 414, 420, 454
 purpurin 20, 104, 224, 247
 Pustiměř (Czech Republic) 304, 310
 Putensen (Germany) 152, 158
 Pylona (Greece) 190, 192
 Pyotdykes (Scotland) 427, 432
 Pyrenees 337
 Quelkhorn (Germany) 121, 133, 152, 156
 quercetin 43, 104
 quern 433
 Rabensburg (Austria) 16, 26, 54, 58
 Radonice nad Ohří (Czech Republic) 305, 326
 Radošovice (Czech Republic) 305, 317, 320
 Raetia 66, 67, 79, 84, 154
 Rainau-Buch (Germany) 152, 167
 ramie 407, 413
 Ramsaukopf (Austria) 26, 29
 Ramsautal (Austria) 26, 59
 Rathgall (Ireland) 427, 429
 Rausdorf (Germany) 152, 158
 raw material 4–5, 20, 41–42, 47, 56, 68, 75, 78, 84, 97, 103, 114–115, 125–126, 132, 141, 155, 187, 197, 218–222, 234, 267, 314, 319, 325–326, 336, 342, 344, 350, 353, 361, 368, 388, 404, 406, 413, 431–432, 452
 Razbuki (Latvia) 265, 271
 Reča (Slovakia) 305, 313
 red 19–20, 32, 43, 46, 55, 104, 110, 113, 127, 130, 134, 141–142, 145, 147, 149, 157, 159–162, 173, 224, 247, 249–250, 271, 279–283, 287, 322, 406–407, 409, 412–413, 419, 432, 437, 454
 reed 207, 368
 Reepsholt (Germany) 121, 134, 152, 162, 175
 Refstrup (Denmark) 90, 114
 Reinecke chronological system 27–28, 60, 123–124, 134, 307–308, 379
 Reinheim (Germany) 121, 127
 Rendswühren (Germany) 152, 161
 rep 12, 32, 36, 41, 43–45, 48, 82, 97, 103, 113, 126, 129–132, 135, 147–148, 157, 159–160, 162, 175, 280, 286, 296, 359, 374, 388, 402, 409, 411–413, 434, 438
 band 30, 31, 32, 42, 43, 44, 49, 54, 82, 135
 repair 4, 17, 34, 36, 40, 43, 49, 104, 109, 161, 320
 Řepov (Czech Republic) 305, 323
 resist-dyeing 17, 399, 407, 412–414, 416, 420
 retting 5, 104, 356
 reuse 49, 54, 75, 77, 103, 104, 110, 281, 343, 351
 rhamnetin 104
 Rheinbach-Flerzheim (Germany) 152, 168
 Rhine River 153, 154, 163, 166, 167, 169, 170, 171, 172, 176, 308, 452
 Rhodes Island 192
 Rhône River 378
 Richmond (England) 443, 446
 Richmond (Ireland) 427, 431
 Riekofen (Germany) 121, 131
 Rietzmeck (Germany) 121, 129
 Risehjarup (Denmark) 90, 114
 rock art 102, 208, 351
 Rønseberg (Norway) 274, 277, 280
 Rössen (Germany) 121, 127
 Röst (Germany) 121, 134
 Romagnano Loch (Italy) 202, 211
 Roman
 Empire vi, 29, 66, 68, 70, 84, 153–155, 162, 167–168, 174–175, 196, 278–280, 287, 294, 301–302, 308, 352, 430, 437, 451
 influence 277, 352, 438
 period vii, 8, 9, 16–18, 25, 54, 57, 59, 65, 67, 70, 84, 154–155, 168, 182, 196–197, 199, 201, 215, 218–220, 226–227, 237, 277, 281, 284, 287–288, 291, 293–295, 297–302, 304, 306, 308, 322–323, 325–327, 332, 342–344, 365, 388–389, 410–411, 416, 437, 438, 451
 Romania 29, 399
 Romanisation 215, 217, 336, 337
 Rome (Italy) 66, 67, 68, 78, 187, 205, 214, 217, 231, 235, 259, 401, 448, 451
 Rommerskirchen (Germany) 152, 167, 173
 rope 5, 49, 167, 175, 205, 234, 270, 336, 338, 342, 370
 Rottenburg am Neckar (Germany) 152, 169
 Rudston (England) 443, 447, 448
 rug 301, 455
 Russia 350, 414
 Rvenice (Czech Republic) 305, 310
 Ryemarksgård (Denmark) 90, 94
 Saalburg (Germany) 152, 163, 167, 171–172
 sack 16, 188, 190, 196, 403, 446
 Sætrang (Norway) 274, 279, 288
 safflower 19, 414, 420
 saffron 19, 79

- sails 1, 233, 237
 Salamis (Greece) 184, 192, 194, 199
 salt vii, 2, 18, 27–32, 37–38, 40–51, 55–56, 59, 125, 229, 262, 275, 296, 310, 314, 327, 334, 446, 448, 453
 salt mine vii, 28–32, 38, 40–49, 51, 55–56, 125, 229, 262, 296, 310, 327, 453
 Salte (Norway) 274, 284, 287
 Salzburg (Austria) 26, 82, 84
 samitum 13, 407
 Sammardenchia (Italy) 214, 220
 Santa Caterina-Castelverde (Italy) 202, 204, 209
 Santa Rosa di Poviglio (Italy) 202, 210–212
 Santorso (Italy) 214, 231, 235
 sarcophagus 155, 168, 173, 195, 230, 340–341, 408, 410, 413
 lead 196, 409
 marble 197
 Sardinia (Italy) 203, 316
 Sarmatian culture 397, 400–401, 405, 407, 414–416, 420
 Sārinate (Latvia) 266, 267, 268, 270
 Sasso di Furbara (Italy) 214–215, 218, 222–223, 228–229, 237, 262
 Savognin-Padnal (Switzerland) 366, 379
 Scandinavia vii, 16, 34, 36–38, 91, 93–94, 102–103, 113–115, 123–125, 128, 131, 135, 228, 275–276, 278, 282, 285, 287–289, 295, 349, 350–352, 429, 430, 433, 445–446
 Scania (Sweden) 351, 352, 353, 356, 362, 363
 Scanning Electron Microscopy – SEM 3, 166, 336, 338, 341, 380, 384, 386, 414
 scarf 104–106, 110, 160
 Schafis (Switzerland) 366, 373, 376
 Schaliß (Germany) 121, 126
 Schleedorf-Mölkham (Austria) 26, 42, 45
 Schnidejoch (Switzerland) 366, 279–280
 Schönering (Austria) 26, 77
 Schöningstedt (Germany) 121, 130
 Schrattenberg (Austria) 26, 30, 42, 45, 51
 Schusterwald Höch (Austria) 26, 45
 Schwarza (Germany) 121, 128, 130, 135
 Schwarzenacker an der Blies (Germany) 152, 169
 Schwenderöd (Germany) 121, 131, 136
 Scotland vi, 426–432, 436–438, 440, 446, 451
 Scythian culture 2, 308, 399, 400–402, 405–407, 410, 413–416, 418–420
 seam 161, 287, 322
 Seden (Denmark) 90, 110
 sedge 368
 Sedlec (Czech Republic) 305, 316–317, 319
 Segeberg (Germany) 152, 157–158
 Segesta (Italy) 214, 224
 Seglheim (Norway) 274, 287
 selective breeding 7, 383, 453
 selvedge 4, 13–14, 132–133, 135, 298, 300, 315–316, 322, 357, 374
 reinforced 82, 161, 162
 Semibratniye Kurgany (Russia) 411, 414
 Seređnij Stog culture 399–400
 Serra di Vaglio (Italy) 214, 236
 Sesto Fiorentino (Italy) 214, 230, 233
 Settefonti (Italy) 214, 220
 sewing 17–18, 29, 36, 46, 55, 60, 71, 75, 94, 101, 104, 129, 143, 156, 161, 169, 188, 206, 229, 236, 318, 320, 416, 434
 decorative 127, 134, 187
 thread 31, 37, 42, 104, 129, 222, 224, 247, 257, 361, 406
 shearing 7, 270, 453
 shears 7, 42, 55, 60, 72–73, 92, 174, 234, 235, 267, 315, 317–320, 322, 391–392, 446, 449, 453
 shed 14–15, 122, 135, 145, 250, 254–255, 257–258, 262, 371, 439
 counter 14–15
 open 14–15
 sheep 6–8, 77, 103, 105, 126–127, 134–135, 155, 163, 175, 209, 219, 221–222, 244, 267–268, 271, 276, 279, 302, 343, 344, 350–352, 361, 381–383, 386–388, 390, 414, 329, 431–432, 435, 437, 440, 445, 449, 452–453
 bones 268, 270, 356, 381, 383, 416
 breed 6, 67, 222, 234, 361, 395
 hornless 350
 husbandry 42, 97, 221–222, 237
 skin 1–2, 91–92, 94, 103, 105–109, 114–115, 132–133, 142, 212, 218, 309, 349–350, 352, 380–381, 384, 390–392, 428, 430–432, 434–437, 440
 slaughter pattern 221–222
 Soay 361, 386, 388
 Sheshader (Scotland) 427, 432
 Shetland Islands 6, 429, 431
 shipwreck 233, 234, 341, 342
 shoe 47, 49, 94
 Shoebury (England) 443, 448
 shroud 1, 9, 56, 65, 83, 141, 143, 167, 194, 197, 227, 230–231, 390, 394–395, 403, 406–407, 431, 446
 shuttle 16, 169, 312
 Sibari (Italy) 214, 237
 Sicily Island 186, 203, 216, 219, 224, 236
 Sievern (Germany) 152, 160
 silk 8, 127, 130, 136, 141–142, 155, 163, 167–168, 173, 174, 176, 195–196, 198, 219, 302, 323, 343, 399, 405, 407–410, 413–415, 420, 448, 454
 Chinese 174, 407, 409, 414, 416
 Road 420
 wild 167–168
 Similaun (Italy) 202–205
 sinew 359, 437
 Sion (Switzerland) 366, 378–379, 382–383
 Siracusa (Italy) 214, 224
 Situla Art 47, 50
 Skærso (Denmark) 90, 113
 Skedemosse (Sweden) 359, 360, 362
 Skegness (England) 443, 448
 skin 1–2, 91–94, 102–103, 105–108, 109, 114–115, 132–133, 142, 205, 212, 218, 271, 309, 349–352, 357, 378, 380–381, 384–385, 390–392, 415, 428, 430–432, 434–437, 439–440
 Skipwith Common (England) 443, 446
 skirt 47, 97, 104, 105, 106, 110, 132, 133, 188, 343
 string 97, 102
 Skrydstrup (Denmark) 90, 93, 97, 101, 130, 432
 Slate (Latvia) 269, 271
 Slavkov u Brna (Czech Republic) 305, 316
 Slavs 295, 419
 sleeve 48, 73, 83, 110, 112–114, 160–162, 173, 249–250, 286, 408, 418, 433–434
 Slovakia vii, 28–29, 46, 50–51, 59, 304–331
 Slovenia 28, 50, 67, 85
 Slusegård (Denmark) 90, 103, 111
 Smolenice-Molpír (Slovakia) 59, 305, 307, 310–311
 smoothing stone 17, 431
 Snartemo (Norway) 274, 277, 278, 279, 282, 283
 Snettisham (England) 443, 449
 soapwort 8
 Soběsuky (Czech Republic) 305, 306
 Söderby (Sweden) 358, 360, 362
 Søgård (Denmark) 90, 110–111, 113–114
 Sörup (Germany) 152, 157, 158
 Sokolova Mohyla (Ukraine) 398, 402, 407, 410–411, 414–416, 420
 Solduno (Switzerland) 366, 379, 387–389, 391–392, 394–395
 Solokha (Ukraine) 398, 418
 Somerleyton (England) 443, 446
 Somma Lombardo (Italy) 202, 204, 209
 Sonnenberg (Germany) 121, 133
 soumak 13, 141–142, 146–147, 149, 228
 sound 94, 102
 spacer 17, 236, 259–261, 263, 430
 Spain vii, 168, 221, 262, 332–346, 452
 specialisation 237, 449
 Spiez-Einingen (Switzerland) 366
 spin – *see* yarn twist

- spin pattern 30–32, 34, 38, 40, 43–47, 54–56, 93, 97, 111, 113, 131, 134, 141, 144, 146, 157, 159–160, 163, 168, 175, 228, 237, 243, 246, 248–250, 262, 281–282, 288, 309, 388–389
- spindle 9–11, 15–16, 51, 68, 70, 72, 74, 76, 85, 105, 109, 114, 127, 230, 235–236, 277, 338–339, 350, 370, 416, 418
bone 9, 70, 78, 156, 416, 418
bronze 76, 235
with integral weight 105, 109
wooden 9, 51, 68, 109, 127, 207–208, 235, 337, 339
- spindle hook 9, 70, 72, 74–78, 85
- spindle whorl 9–11, 41–42, 51, 54, 57, 68, 70, 72, 75, 77–78, 102, 127–128, 134, 156, 168, 175, 203, 206–208, 210–211, 235, 237, 266–267, 269, 309–312, 325–327, 335, 337–338, 350, 352, 369–370, 382–383, 416–417, 430–431, 433, 449
biconical 54, 70, 232, 235, 383, 416
clay 9, 41, 51, 54, 105
conical 54, 416
cylindrical 211, 416
discoid 10, 54, 210, 383
glass 10, 72, 74, 114, 235
lead 416
lenticular 10
made of potsherd 54, 68, 70, 72, 259, 431
stone 9, 105, 114, 369, 431, 433
- spinning 4, 9–11, 51, 54, 57, 68, 70–71, 75, 78, 82–83, 103, 115, 127, 134, 156, 162, 175, 176, 188, 194, 210, 221–222, 233, 235–236, 251, 270, 272, 311–312, 338, 370, 380–381, 391, 405, 415–416, 430, 447, 449, 453
hook 9, 70, 127
- Spitalfields (England) 443, 454
- splicing 10, 11, 381
- spool 11, 54, 206, 229, 236, 259–263, 313, 318, 383, 385, 417, 419
- sprang 11–12, 18, 97, 105, 113, 129–131, 134, 157–158, 160, 167, 173, 269, 284–285, 287, 296, 401, 418, 446, 451
- Srejach (Austria) 26, 77
- Strubna culture 400, 416
- St. Agatha (Austria) 26, 77
- St. Andrews (Scotland) 427, 432, 435
- St. Peter in Holz (Austria) 26, 84
- St. Pölten (Austria) 26, 75
- St. Sulpice (Switzerland) 366, 392
- standardisation 56, 59–60, 105, 107, 113, 237, 278, 308, 371, 376, 395,
- Stanislavka (Ukraine) 398, 403
- Staňkovice (Czech Republic) 305, 317
- Stanway (England) 443, 448, 454
- Stare Kolnie (Poland) 292, 296
- Staré Město (Czech Republic) 305, 309
- status 1, 10, 65–66, 70, 76, 78, 94, 124, 139, 149, 155, 175, 217–218, 229, 235, 243–244, 251–252, 277, 312–314, 351, 389, 428–430, 433, 435–436, 439, 447
- Stehelčevy (Czech Republic) 305, 321
- Steinheim (Germany) 121, 126, 130, 135
- Steinheim an der Murr (Germany) 121, 135
- Stettfeld (Germany) 152, 168
- stitch 17, 315, 316, 321, 322, 407, 447
buttonhole 36, 43, 101
contouring 407–408
hem 17
overcast 17, 43, 101, 249, 344, 357, 361
running 17, 43, 101, 249, 322
stem 43
- Stolberg (Germany) 91, 93, 94, 102, 114, 115, 124, 128, 349, 351
- stone setting 430
- stele 234, 236, 382
- Stora Fagerås (Sweden) 348, 357
- Stránce (Czech Republic) 305, 317
- Straubing-Ortler (Germany) 121, 126, 129
- string 14, 94, 97, 102, 143, 261, 296, 307, 309, 315, 317, 320, 341, 449, 452
- Strontium isotopes v, 94, 103, 175, 353, 361, 363
- Strückhausen (Germany) 152, 162, 175
- Subingen (Switzerland) 366, 380, 383–384, 387–388
- Südensee (Germany) 152, 157, 158
- Sugokleya (Ukraine) 398, 402, 403, 404
- supplementary weft 192, 194
- Sutz-Rütte (Switzerland) 366, 370
- Svätý Peter (Slovakia) 305, 315, 321–322
- Svatova Luchka (Ukraine) 398, 408, 416
- Světec u Bíliny (Czech Republic) 303, 326
- Sweden 91, 103, 125, 170, 347–363
- Świbie (Poland) 292, 296
- swingle 266, 268, 356
- Switzerland 28, 85, 124–125, 135, 262, 365–377, 378–395
- Syria 197, 301
- Szwajcaria (Poland) 292, 298
- tabby
balanced 12, 46, 189–199, 341, 363, 405–406, 432
extended 12, 132, 161, 163, 176, 371
plain 38, 288, 315
unbalanced 403
warp-faced 12, 223, 361, 363, 413
weft-faced 12, 190–199, 228, 374, 405–407, 412–415
- tablet 11, 13, 43, 54–55, 60, 73, 113, 128–129, 147, 157, 161–162, 169, 236, 247, 248–249, 254–263, 280–289, 296, 326, 341, 362, 384, 414
- tablet weaving 11, 13, 39, 43, 45–47, 54–57, 84, 113–114, 128, 130–131, 134, 135, 141–145, 147–149, 157, 160–163, 171, 175–176, 228–229, 236–237, 244, 248–251, 254–263, 269, 278–288, 296, 298–300, 313, 323, 326–327, 341–342, 344, 358–363, 383–385, 389, 417, 438–439, 449
- Tacitus 153, 440
- tailoring 4, 93, 114, 116, 406, 416, 418
- tannin 19–20, 43, 46, 361, 431
- tanning 21, 431
- tapestry 13, 17, 168, 171, 173, 196–197, 289, 326, 407, 412–413, 415, 420, 454
- Taranto (Italy) 85, 214, 224, 226–227, 236–237
- Tarquinius (Italy) 214, 221, 223, 226, 228–230, 232–233, 237, 249
- Tartessian culture 335
- Tartessos 336
- tassel 13, 97, 101, 113, 187, 280, 434
- tebenna* 251
- Techelwitz (Germany) 152, 162
- Tegle (Norway) 274–275, 277–279, 284–285, 287
- Telemark (Norway) 274, 281
- Telnice (Czech Republic) 305, 316
- tent 221, 233, 384–385
- Terremare culture 203, 204, 211
- Tesserae plumbeae* 65, 67–68, 72, 74–75, 77–80, 82, 84, 169
- Theodosia (Ukraine) 398, 401
- Thessaloniki (Greece) 196, 343
- Thorsberg (Germany) 110, 113, 152, 155, 157, 162–165, 175
- Thorup (Denmark) 90, 105
- Thürkow (Germany) 121, 127, 129–130, 133
- Thracians 400
- thread count 4, 12–13, 29–32, 37, 43–44, 47, 55–56, 59, 82–84, 93, 97, 110, 130–131, 134, 157–161, 163, 168, 171–172, 175, 188, 190–191, 192–197, 198–199, 207, 211, 228, 244, 248–249, 257, 271, 278–283, 287–288, 307, 309–310, 314, 318–322, 326–327, 338, 342, 344, 353, 356–357, 361–363, 389, 402–403, 405–409, 411, 412, 415–416, 432, 437–438, 446–448, 454
- Throne of Verucchio 232–233, 236, 244, 251, 260–263
- Tintinnabulum* of Bologna 54, 57–58, 233, 236, 251, 258
- Tišice (Czech Republic) 305, 317, 320
- Tofting (Germany) 152, 156, 163
- toga praetexta* 251

- Tollund Man 90, 103–104
 Toporów (Poland) 292, 301
 Tornebuskehøj (Denmark) 90, 113
 Tovsta Mohyla (Ukraine) 379, 407, 420
 trade v, 27–29, 42, 56, 59, 66, 68, 72, 75, 77, 79–80, 84, 92, 149, 154, 167, 169, 186, 217, 243, 268, 276–278, 281, 308, 311–313, 327, 335–336, 351–352, 378–379, 401, 414, 429, 445, 451
 transhumance 67, 222
 Trasdorf (Austria) 26, 30
 Trebitz (Germany) 152, 160
 Třebusice (Czech Republic) 305, 322
 tree bast 5, 27, 115, 127, 205–207, 209, 211, 219, 368–369, 403, 413
 Trier (Germany) 152, 155, 167–170, 173–174
 Triffling (Germany) 120, 131, 136
 Trindhøj (Denmark) 90, 93, 97, 101
 Trnovec nad Váhom (Slovakia) 305, 314–315, 321
 Troisdorf (Germany) 152, 156
 trousers 47–48, 110, 113, 161–162, 282, 287, 380, 418–419
 True Mose (Denmark) 90, 108
 Trygslund (Norway) 274, 282
 Trzcinec culture 293
 tubular warp 16, 34, 102, 105, 113–114, 128–129, 163, 301, 361, 363
 Tuchomyśl (Czech Republic) 305, 317, 320
 Tulstrup (Denmark) 90, 94
 tumulus – *see* burial mound
 Tumulus culture 28, 123, 198, 293, 307, 312, 351, 379, 384, 392, 405, 448
 tunic
 sleeved 113–114, 160, 434
 sleeveless 113, 161, 250
 with curved edges 250, 257, 265
 Turkey 8, 186
 Tursko-Těšiny (Czech Republic) 305, 309
 Tværmoose (Denmark) 90, 94
 Twann (Switzerland) 366, 370, 373, 375, 378, 380
 twill 2, 6, 12–13, 15, 32, 37, 40, 42–46, 48, 54–56, 60, 84, 97, 114, 128, 131–135, 142–143, 147–149, 157–163, 172, 175–176, 206, 211, 228–229, 243–244, 255, 257, 260, 278–285, 288, 297, 299, 302, 310, 314–317, 319–323, 326, 343, 361, 362–363, 387–389, 394–395, 406–407, 411, 413, 415–416, 437, 447–449, 454
 2/2 13, 37, 43–45, 47, 49, 56, 83, 93, 97, 103, 110, 127, 130–134, 141, 144, 147–149, 157–163, 171, 173–175, 223, 244, 248–250, 269, 271, 279, 280–288, 296–300, 302, 310, 315–320, 322, 326, 343–345, 358–359, 361–363, 383, 387–388, 390–391, 394, 434–438, 446–448, 454
 broken 162, 176, 326, 358, 361, 437
 chevron 37, 43, 45, 194, 223, 438
 diamond 93, 110, 112, 130, 133, 141, 157–163, 168, 171–172, 223, 229, 275, 278, 280–281, 283, 287–288, 296–297, 299, 302, 322, 358–359, 361–363, 406, 436–437, 446–448, 454
 herringbone 13, 32, 43, 168, 448, 454
 lozenge 43–45
 with pattern repeat 93
 twining 11, 157, 204, 208–209, 228, 371, 381, 403, 415
 split-ply 171
 warp 282
 weft
 twist – *see* yarn twist
 twist angle 4, 9, 127, 403, 406
 Tybrind Vig (Denmark) 90, 94
 Tyrrhenian Sea 202, 214, 216–217
 Udenheim (Germany) 121, 131
 Uelsby (Germany) 121, 135
 Uelversheim (Germany) 121, 131
 Uerschhausen-Horn (Switzerland) 366, 379, 385
 Uffing (Germany) 121, 131
 Ugulen (Norway) 264, 278, 286
 Ukraine vii, 84, 295, 397–425
 Ulkowsy (Poland) 292, 297–298
 Ullastret (Spain) 335
 Únětice culture 27, 123, 293
 Unterhaid (Germany) 152, 163
 Untermassing (Germany) 121, 133
 Unterradlberg (Austria) 26, 54
 Unterteutschental (Germany) 121, 126, 130
 Urnfield culture 28, 38, 54–55, 123, 294, 307–308, 379
 Ust'-Al'ma (Ukraine) 398, 408–409, 414–416, 420
 Utikon-Üetliberg (Switzerland) 366
 Utilitarian textiles 47, 133, 149, 215, 223, 233
 Uttendorf im Pinzgau (Austria) 26, 42, 44–45, 49, 54
 Valeggio sul Mincio (Italy) 214, 220
 Valle delle Paiole (Italy) 202, 204, 207, 209, 219
 Valsgårde (Sweden) 348, 353
 Vassallaggi (Italy) 214, 229, 233
 Vedbæk (Denmark) 90, 94
 Vedretta di Ries (Italy) 212, 214, 218–219, 223–224, 229
 Vehnemoor (Germany) 152, 162
 Veiem (Norway) 274, 278–279, 286–287
 Veien (Norway) 274, 279, 281
 veil 47, 82, 130–133, 419
 Veio (Italy) 212, 218, 219, 231, 232, 261
 Veliký Brázdim (Czech Republic) 305, 317
 Veľká Maňa (Slovakia) 305, 318, 321
 Velké Přílepy (Czech Republic) 305, 323
 Velykyi Ryzhanivs'kyi Kurhan (Ukraine) 398, 406, 415–416
 Vemestad (Norway) 274, 278, 282–283
 Vergina (Greece) 183, 195–196
 Verucchio (Italy) vi, 17, 214–215, 218, 222–224, 228–232, 236–237, 242–253, 255–263, 389
 Vestrum (Norway) 274, 282
 Vetulonia (Italy) 214, 220, 232, 261
 Vevey (Switzerland) 366, 395
 viburnum 207, 211, 368
 Vidy (Switzerland) 366, 391, 393–395
 Vigra (Norway) 274, 280
 Viking Age 347, 352–353, 439
 villa 67–68, 74, 77, 154, 451–453
 Villanovan culture 216, 218, 224, 232, 242, 247
 Vilstrupgård (Denmark) 90, 103
 Vimose (Denmark) 90, 93, 110
 Vindobona – *see* Wien
 Vindolanda Fort (England) 443
 Vinelz-Strandboden (Switzerland) 366, 370
 Virring type 113, 280, 287–288, 301–302
 Virunum – *see* Maria Saal
 Vistula River 294
 visual quality 94
 Vitzke (Germany) 152, 160
 Völschow (Germany) 152, 156
 Vösendorf (Austria) 26, 30, 32, 40, 55
 Volano San Rocco (Italy) 214, 220
 Volga River 400
 Vorbasse (Denmark) 90, 114
 Voronezhskie Kurgany (Russia) 398, 419
 Vorarlberg (Austria) 26, 67
 Vulci (Italy) 214, 227, 230, 261
 Vyshneva Mohyla (Ukraine) 398, 406, 415–416
 Wagna (Austria) 26, 73
 wall
 hanging 133, 143–144, 149, 233
 painting 66, 233, 242, 249
 Walldürn (Germany) 152, 172
 Wallscheid (Germany) 121, 131, 136
 Wallwitz (Germany) 121, 128
 Wandlebury Hill Fort (England) 443, 446
 Wangen (Germany) 121, 126
 Wansleben (Germany) 152, 160
 warp
 bundle 14, 161–162, 171, 454
 tubular 14, 16, 34, 102, 105, 113–114, 128–129, 163, 301, 361, 363

- waterlogging 2, 203–204, 208–209, 211, 215, 235, 259, 306, 378
- weapon deposit 92, 93, 94, 110, 113, 162, 175, 349, 360, 362
- wear 3–4, 36, 47, 70, 143, 230, 249, 313, 325, 370
- weave 4, 6, 11–14, 16, 29, 32–34, 37, 42–43, 48, 54–55, 59, 93, 110, 113, 131, 133, 141, 157, 168, 175, 190–191, 198–199, 206, 222–223, 228, 251, 287, 196, 302, 310, 323, 345, 454, 358–359, 394, 412, 454
- weaving
 comb 18, 453
 error 4, 34, 347, 257
 knife 208, 261
 sword 18, 71, 75, 129, 156, 203, 261, 277–278, 453
- weft 4, 11–16, 32, 34, 36, 42–47, 54, 82–83, 127, 130–131, 134–135, 142–143, 146–147, 149, 161–162, 168, 173, 187, 189–199, 207, 211, 223, 227–228, 244, 246, 248–250, 254–258, 260–261, 263, 280, 284–285, 288, 295, 298–299, 301, 319–323, 327, 339–344, 353, 356–363, 371, 373–374, 376, 387, 402–403, 405–409, 412–413, 415, 437–439, 446–447, 453–454
 crossing thread 280, 361
- weft wrapping – *see* soumak
- Wehringen (Germany) 152, 167, 174
- Weilerswist-Klein-Vernich (Germany) 152, 167–168
- Weklice (Poland) 292, 298
- weld 19, 32, 40, 46, 407, 409
- Wels (Austria) 26, 84
- Węsiory (Poland) 292, 298
- West Baltic culture 298
- Wetwang Slack (England) 443, 446–449
- Wetzikon-Robenhausen (Switzerland) 366, 368, 371, 373, 380
- Weyhausen (Germany) 121, 126
- white 6, 46, 55, 97, 104, 110, 113, 160, 167, 189, 221–222, 287, 361, 386, 395, 406
- Wiebendorf (Germany) 152, 158
- Wielbark culture 156, 295, 297–299, 301–302
- Wien (Austria) = Vienna 26, 67, 84
- Wiepenkathen (Germany) 121, 126
- willow 5, 207, 209, 211, 270, 338, 368, 436, 449
- woad 19, 32, 40, 46, 145, 224, 279, 282, 284–285, 287, 407, 414
- Wołów (Poland) 292
- wool
 fleece 6–7, 43, 79, 97, 103, 163, 222, 234, 279, 343, 386, 452–453
 kemp 7, 10, 126, 134, 209, 361
 quality 6–7, 29, 103, 222, 279, 302, 361, 386–387, 389, 392, 394, 453
 pigmented 46, 97, 104, 168, 189, 271, 361, 386, 388, 447
 processing 7–8, 68, 163, 386, 395
 raw 285, 302, 409
 sorting 8, 103, 453
 underwool 7, 97, 126, 142, 209, 222, 361, 386, 453
 white 97, 104, 222, 361, 386, 395, 406
- wolf skin 105, 435
- workshop 27, 29, 59, 72–73, 75, 77, 79, 114, 169, 195, 237, 321, 323, 325–327, 343, 352, 444, 449
- Worms-Herrnsheim (Germany) 121, 125, 131
- Wotenitz (Germany) 152, 156, 158
- wrapping 40, 49, 110, 133, 142, 144, 153, 158, 162, 172–173, 175, 197, 220, 233, 249, 270, 306, 310, 314, 317, 319, 320, 322, 384–385, 433
- Xanten (Germany) 152–153, 163, 166–167, 169, 171–172
- Yamna (Pit Grave) culture 400, 402–404
- yarn
 diameter 4, 13, 29–32, 37, 41–44, 46, 51, 55–56, 59, 82–83, 187–188, 190–199, 206–207, 209, 211, 223, 270–271, 315–317, 338–344, 354–355, 358, 381, 404–406, 408–409
- plied 9, 30, 37, 40, 42–46, 55, 82, 104, 126, 129–136, 142, 149, 161, 167–168, 171, 175, 187–188, 190, 192, 194, 197, 205, 227–228, 257, 261–262, 270, 288, 309–310, 315, 318–320, 322–323, 338–342, 344, 362, 380–381, 384, 388, 403–406, 409, 432, 447
- twist (spin) 4, 9, 30–34, 37–38, 41–47, 56, 82–83, 93, 97, 103, 110–111, 113, 126, 129–136, 142, 144, 146–147, 149, 157–163, 167–168, 173, 175–176, 187–188, 190–191, 194–199, 207, 220–223, 228, 246, 248–250, 255, 257, 261–262, 270–271, 278–288, 295, 298–299, 309–310, 314–317, 319–320, 322–323, 326, 338–345, 353–356, 358, 361–363, 370, 376, 384, 388, 403–410, 415, 432, 438, 445–449, 454
- yellow 6, 19, 32, 34, 43, 46, 49, 160, 223–224, 249, 279, 280–283, 285–287, 361–362, 407, 409, 413–414, 437
- Yevpatoriya (Ukraine) 398, 401
- Yuz-Oba (Ukraine) 398, 409
- Yverdon-les-Bains (Switzerland) 366, 379
- Zaječí (Czech Republic) 305, 321
- Zakrzew (Poland) 292, 296
- Zakrzów (Poland) 292, 298, 300–301
- Záluží u Čelákovice (Czech Republic) 305, 326
- Zante (Latvia) 265, 271
- Żerniki Wielkie (Poland) 292, 298–299
- Zhabotyn (Ukraine) 398, 416
- Zielonki (Poland) 292, 295
- Zillingdorf (Austria) 26, 79
- Zohor (Slovakia) 305, 322
- Zolota Mohyla (Ukraine) 398, 420
- Zürich (Switzerland) 366, 370, 377–378, 380–382, 395
- Żywa Woda (Poland) 292, 298

